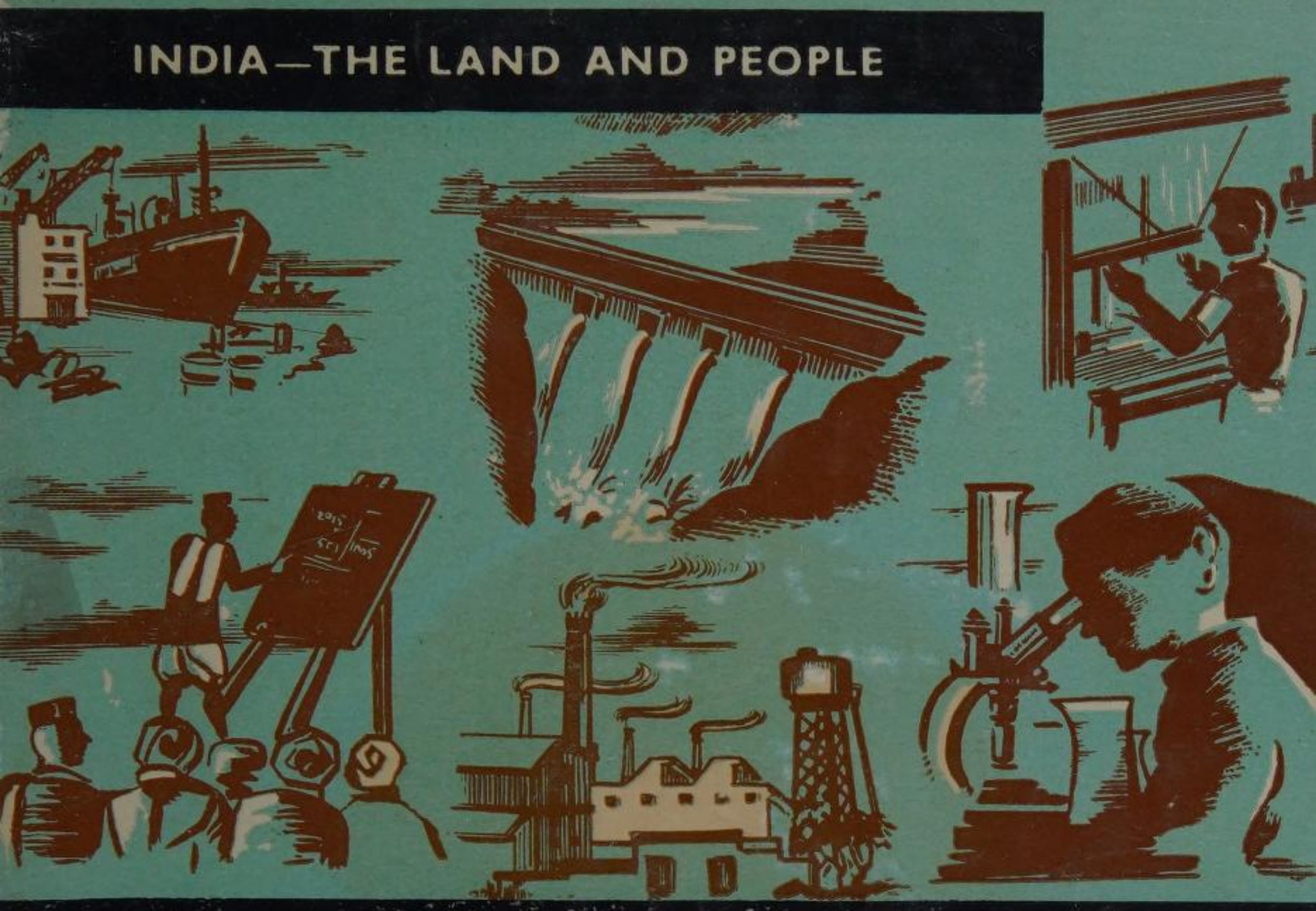


ECONOMIC GEOGRAPHY OF INDIA

V. S. GANANATHAN

NATIONAL BOOK TRUST, INDIA

SHOUT
SHARE
IT

EDUCATED at Madras and Syracuse, N.Y. (U.S.A.), Prof. V.S. Gananathan has been the Head of the Department of Geography at the University of Poona for the past sixteen years.

He has to his credit a large number of papers published in International Geographical Journals. Prof. Gananathan has been actively connected with several committees set up by the Government for publication of books on Geography.

He has travelled widely, having been abroad a number of times. In the present book he has analysed the main economic trends in the country objectively.

ECONOMIC GEOGRAPHY OF INDIA

BOARD OF HONORARY EDITORS FOR THE SERIES

Chief Editors

Dr. B. V. Keskar — Prof. M. S. Thacker

AGRICULTURE AND BOTANY

Dr. H. Santapau,
Director, Botanical Survey of India,
Calcutta.

Dr. M. S. Randhawa, D.Sc.,
F.N.I., I.C.S.,
Chief Administrator &
Secretary to Government, Punjab,
Chandigarh.

Dr. B. P. Pal, M.Sc., Ph.D. (Cantab),
F.N.I., F.L.S., F.B.S.,
Director General, Indian Council for Agricultural Research & Additional Secretary to the Government of India,
Ministry of Food & Agriculture,
New Delhi.

CULTURE

Dr. Moti Chandra, M.A., Ph.D.
(London),
Director, Prince of Wales Museum of Western India, Bombay.

Shri A. Ghosh, M.A., Hony. F.S.A.,
Director General of Archaeology in India, New Delhi.

Shri Umashankar Joshi,
Vice-Chancellor,
Gujarat University, Ahmedabad.

GEOGRAPHY

Dr. S. P. Chatterjee, M.Sc.,
Ph.D. (London), D. Litt. (Paris),
Director,
National Atlas Organisation,
Ministry of Education,
Government of India,
Calcutta.

Dr. George Kuriyan, Ph.D. (London),
Professor of Geography,
University of Madras, Madras-5.

GEOLOGY

Dr. D. N. Wadia, F.R.S.,
National Professor of Geology &
Geological Adviser to Govt. of India,
New Delhi.

Dr. M. S. Krishnan, M.A., Ph.D.
(London), F.N.I., F.A.Sc.,
Formerly Director, National Geophysical Research Institute, Hyderabad.

METEOROLOGY

Shri S. Basu,
Retired Director General of Observatories & Treasurer, National Institute of Sciences of India, New Delhi.

SOCIOLOGY AND SOCIAL SCIENCES

Prof. Nirmal Kumar Bose, F.N.I.,
Formerly Director, Anthropological Survey of India, Calcutta.

Prof. V. K. N. Menon, Trivandrum.

Dr. S. M. Katre,
Director, Deccan College Post-Graduate and Research Institute, Poona-6.

ZOOLOGY

Dr. M. L. Roonwal, M.Sc., Ph.D. &
D.Sc. (Cantab), F.N.I.,
Vice-Chancellor,
University of Jodhpur,
Jodhpur.

Dr. Salim Ali, D.Sc., F.N.I.,
Vice-Chairman, Bombay
Natural History Society, Bombay.

Prof. B. R. Seshachar, D.Sc., F.N.I.,
F.A.Sc.,
Head of the Department of Zoology,
University of Delhi, Delhi.

FOREWORD

THIS is another addition to the Series that the National Book Trust has planned on "India—the Land and People."

The origin of the Series is the result of a discussion that I had with the late Prime Minister, Pandit Jawaharlal Nehru. When I first put the idea before him, he not only heartily approved it but gave many suggestions for making it more complete and attractive. It was his opinion that such a Series of books on India will form a permanent library of knowledge on every aspect of this country and is sure to make constructive contribution for national advancement in knowledge and education.

The Series proposes to cover every aspect of the country and will deal with its geography, geology, botany, zoology, agriculture, anthropology, culture, language, etc. Its ultimate aim is to create a kind of comprehensive library of books on India. We have endeavoured to have the books written by acknowledged authorities on various subjects and in a scientific way. Every effort is being made to see that they are easily understandable by the ordinary educated reader. The factual knowledge regarding the various subjects concerning India would be available to any ordinary reader who is not a specialist and who would like to have a knowledge of the subject in a relatively simple language.

We have been fortunate in getting the guidance of leading experts and scientists in various fields for this Project. In fact without their active cooperation it would not have been possible to plan the Series. We are thankful to our Board of Honorary Editors who are eminent specialists and leaders in their field for helping us in producing these volumes for the benefit of the ordinary reader.

One of the objects of the Series is to make it available in as many Indian languages as practically possible. The work of

translating them in various languages will be taken up as soon as the original books are ready. In fact a few volumes might be originally written in some of the languages.

We have received full support from the Ministry of Education of the Government of India and the State Governments. They are lending their help in many ways not the least by permitting scientists working under them to write for the Series. I would like to take this opportunity of thanking them. Without their help it would not have been possible to undertake this enterprise of national utility.

I am very grateful to my colleague, Professor M. S. Thacker, Member of the Planning Commission, for agreeing to be Co-Chief Editor. His enthusiastic collaboration has greatly helped in planning the Series successfully. Prof. George Kuriyan, who is the Editor of the geography books in the Series, has been most helpful in the selection of subjects, planning and laying down outlines of books and finally in reading through the manuscripts and giving his valuable suggestions for improving them. Without his active help and co-operation, it could not have been possible to bring out books on geography with so much satisfaction. The Trust gratefully acknowledges his contributions to the Series.

NEW DELHI
September 22, 1967

B. V. KESKAR

INTRODUCTION

THE plan of the National Book Trust, India, is to publish a number of small volumes each of which would be on one important aspect of India. The author, who was requested to prepare the volume on Economic Geography of India, has tried to do his best. A comprehensive view, with depth at places, has been given.

For most of the data the uniformly recent year is 1962-63; is some cases a later year has been specifically mentioned. Achievement in a single year is not so important as the nature of achievements in the recent few years. Trends are more important than short-period achievements. The author has tried to indicate the trends, the averages in production and so on. The aim has been to give an objective picture, a perspective rather than an accurate profile or contour drawing.

Since the country is passing through a period of internal and external pressures, sudden changes occur in most aspects of its vibrating life; some of these may appear to be contrary to the conclusions indicated in the body of this volume; but the truth lies in trends based on past years' performances.

The author would be thankful to the readers of this volume for helpful suggestions and constructive criticism.

Shri T. H. Jachak, Miss Razia Shaikh and Miss Veena Motee were very helpful in the preparation of the maps and the manuscript; the author desires to record here his appreciation of the help rendered by these people to him.

Without the helpful suggestions and encouragement received from Prof. George Kuriyan it would not have been possible to get this work done. Prof. Kuriyan was good enough to read through the manuscript; all his helpful suggestions have been adopted. The author is very thankful to him for all this help.

V. S. GANANATHAN

CONTENTS

		Page
	FOREWORD	v
	INTRODUCTION	vii
CHAPTER		
I	Physiography	1
II	National Resources	11
III	Land-use : Food Crops	21
IV	Land-use : Oil-Seeds and Spices ..	33
V	Land-use : Other Crops	42
VI	Land-use and Self-sufficiency	50
VII	Development of Industries	56
VIII	Development of Industries (contd.) ..	69
IX	Transportation and Communication ..	81
X	A Dependent People	94
	APPENDIX—TABLES I TO XX	101
	BIBLIOGRAPHY	131
	INDEX	133

LIST OF TABLES

TABLE		PAGE
I	Area Under Principal Crops ..	101
II	Production of Principal Crops ..	103
III	Crop Seasons ..	105
IV	Principal Irrigation Works ..	106
V	Quantity and Value of Minerals Produced	110
VI	Petroleum Production ..	112
VII	Achievements in Selected Industries ..	113
VIII	Achievements in Selected Industries ..	115
IX	Achievements in Selected Industries ..	116
X	Achievements in Selected Industries ..	117
XI	Achievements in Selected Industries ..	118
XII	Achievements in Selected Industries ..	119
XIII	Achievements in Selected Industries ..	120
XIV	Imports of Principal Merchandise ..	121
XV	Composition of Imports ..	122
XVI	Exports of Principal Indian Merchandise	123
XVII(A)	Area and Population ..	124
XVII(B)	Vital Statistics ..	126
XVIII	Total Literate Population ..	127
XIX	Growth of Urbanisation ..	129
XX	Rural and Urban Population 1961 ..	130

LIST OF MAPS

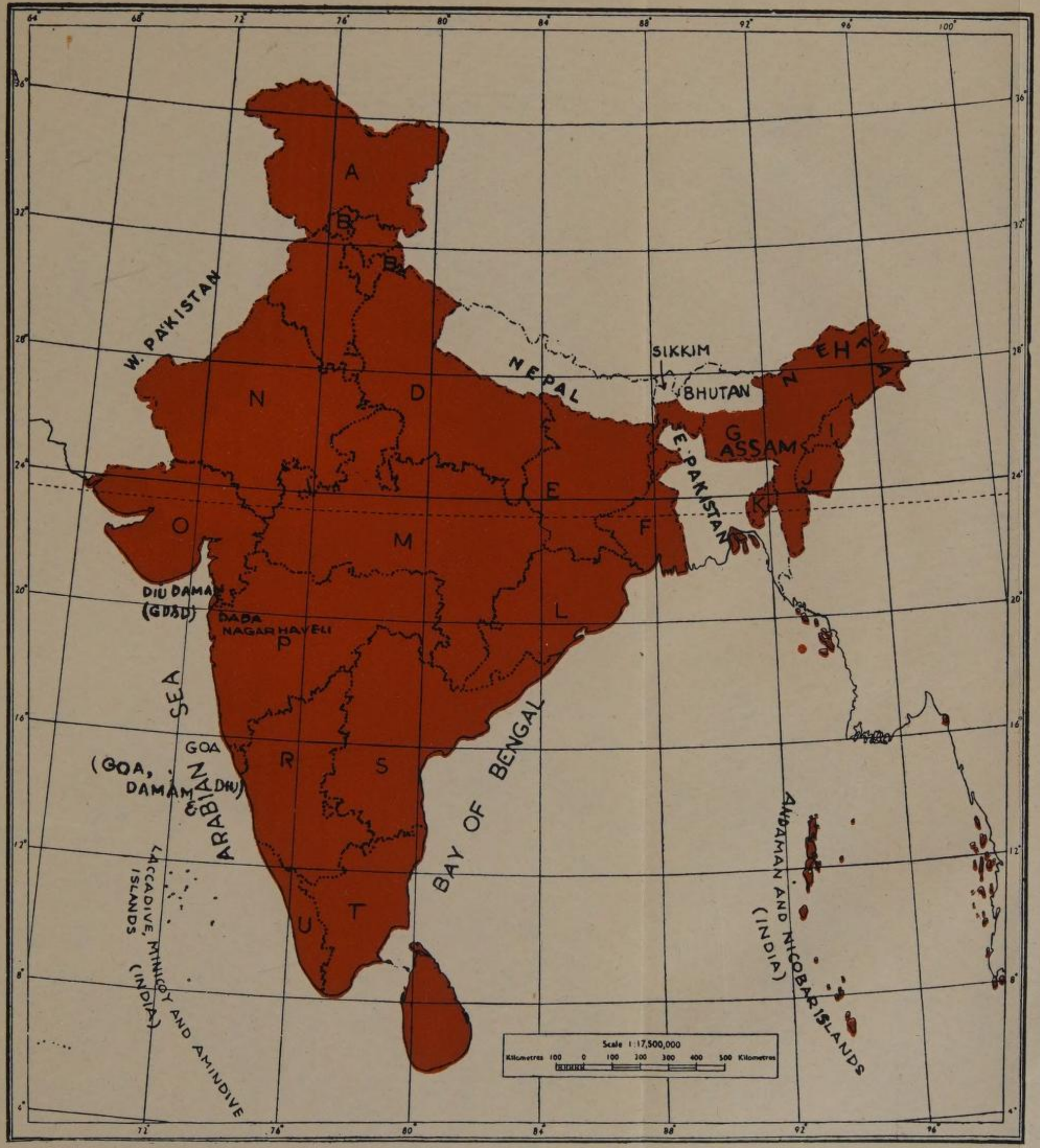
MAP		FACING PAGE
1.	India — Physical ..	1
2.	India — Political	
3.	India — Areas of Highest and Lowest Temperatures Recorded	4
4.	India — Approximate Dates of the Onset of Monsoons	5
5.	India — Mean Annual Rainfall ..	6
6.	India — Variability of Rainfall ..	8
7.	India — Agricultural Regions ..	21
8.	Rice (dot map) ..	22
9.	Wheat (dot map) ..	26
10.	Some Important Cash Crops ..	31
11.	Pepper, Cardamom and Turmeric ..	36
12.	Arecanut ..	37
13.	Power Minerals ..	59
14.	Four Other Important Minerals ..	73
15.	Major Industrial Undertakings in the Public Sector	74
16.	Coalfields and Industrial Centres ..	75
17.	India — Railways (and Zones) ..	82
18.	India — Trunk Roads and Air Routes ..	90
19.	India — Density of Population ..	94

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

PLATE		FACING PAGE
1.	Eastern Himalayas — Everest and other Peaks ..	2
2.	Landscape in Kashmir ..	3
3.	Silver Fir Forests in Western Himalayas ..	15
4.	A Rural Landscape ..	16
5.	Paddy Cultivation ..	24
6.	Wheat Cultivation in Central India ..	24
7.	Millet ..	25
8.	Maize Farm in North India ..	25
9.	Coconut Plantation ..	32
10.	Pepper Plant ..	33
11.	Betel Vine ..	40
12.	Tobacco Plantation in Andhra Pradesh ..	40
13.	Tea Plantation in North-East India ..	41
14.	Coffee Plant ..	41
15.	A Headload of Cotton in Gujarat ..	48
16.	Jute Crop ..	49
17.	Mango	64
18.	Iron and Steel Industry — Rourkela ..	65
19.	Shipbuilding Industry—Visakapatnam, Andhra Pradesh ..	80
20.	Aircraft Industry—Bangalore, Mysore State ..	81

Map 2 **India—Political**



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

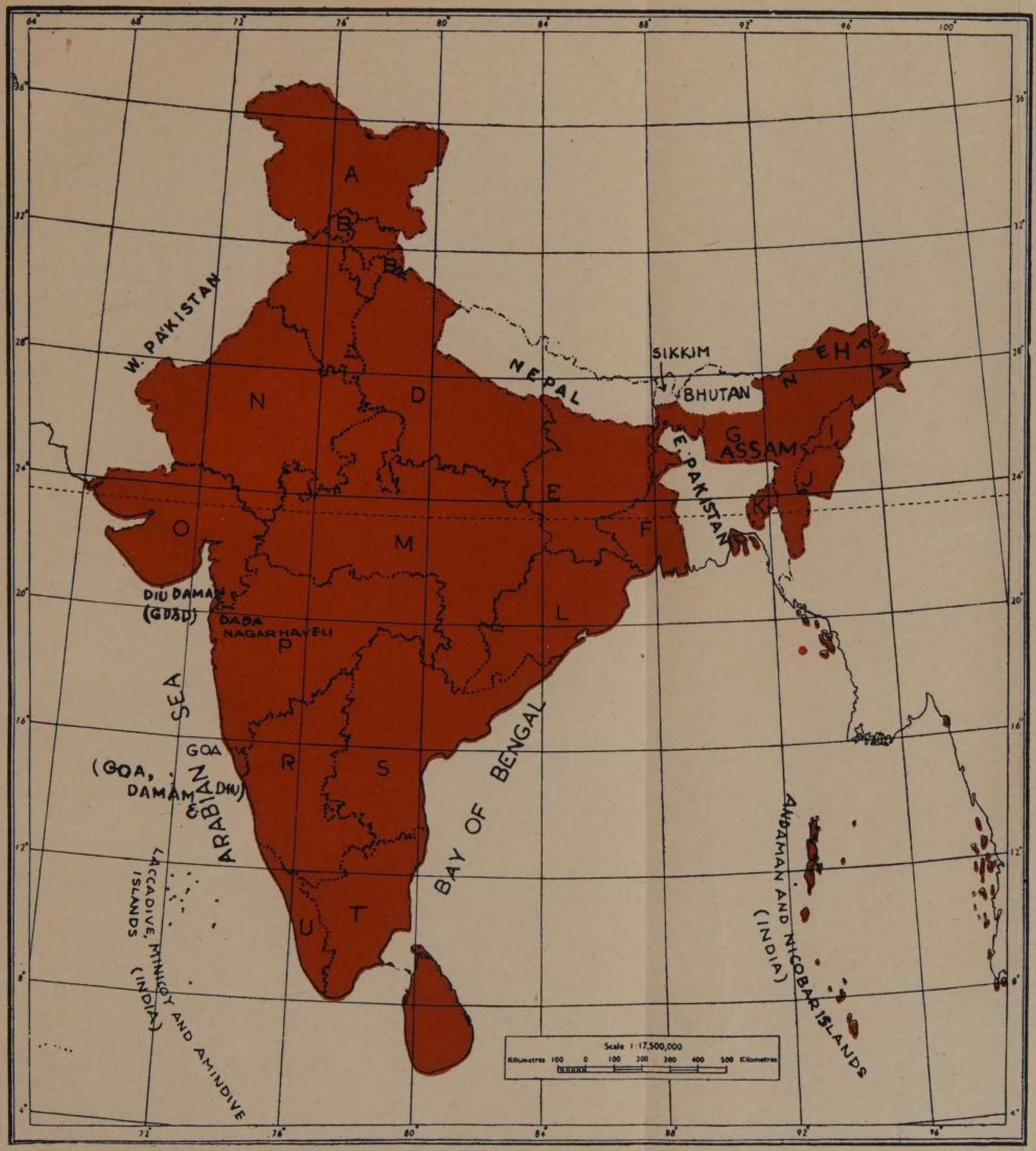
© GOVERNMENT OF INDIA COPYRIGHT, 1964.

A — Jammu & Kashmir; **B** — Himachal Pradesh; **C** — Punjab; **D** — Uttar Pradesh; **E** — Bihar; **F** — West Bengal; **G** — Assam; **H** — NEFA; **I** — Nagaland; **J** — Manipur; **K** — Tripura; **L** — Orissa; **M** — Madhya Pradesh; **N** — Rajasthan; **O** — Gujarat; **P** — Maharashtra; **R** — Mysore; **S** — Andhra Pradesh; **T** — Madras; **U** — Kerala.

LIST OF ILLUSTRATIONS

PLATE		FACING PAGE
1.	Eastern Himalayas — Everest and other Peaks ..	2
2.	Landscape in Kashmir ..	3
3.	Silver Fir Forests in Western Himalayas ..	15
4.	A Rural Landscape ..	16
5.	Paddy Cultivation ..	24
6.	Wheat Cultivation in Central India ..	24
7.	Millet ..	25
8.	Maize Farm in North India ..	25
9.	Coconut Plantation ..	32
10.	Pepper Plant ..	33
11.	Betel Vine ..	40
12.	Tobacco Plantation in Andhra Pradesh ..	40
13.	Tea Plantation in North-East India ..	41
14.	Coffee Plant ..	41
15.	A Headload of Cotton in Gujarat ..	48
16.	Jute Crop ..	49
17.	Mango	64
18.	Iron and Steel Industry — Rourkela ..	65
19.	Shipbuilding Industry—Visakapatnam, Andhra Pradesh ..	80
20.	Aircraft Industry—Bangalore, Mysore State ..	81

Map 2 **India—Political**

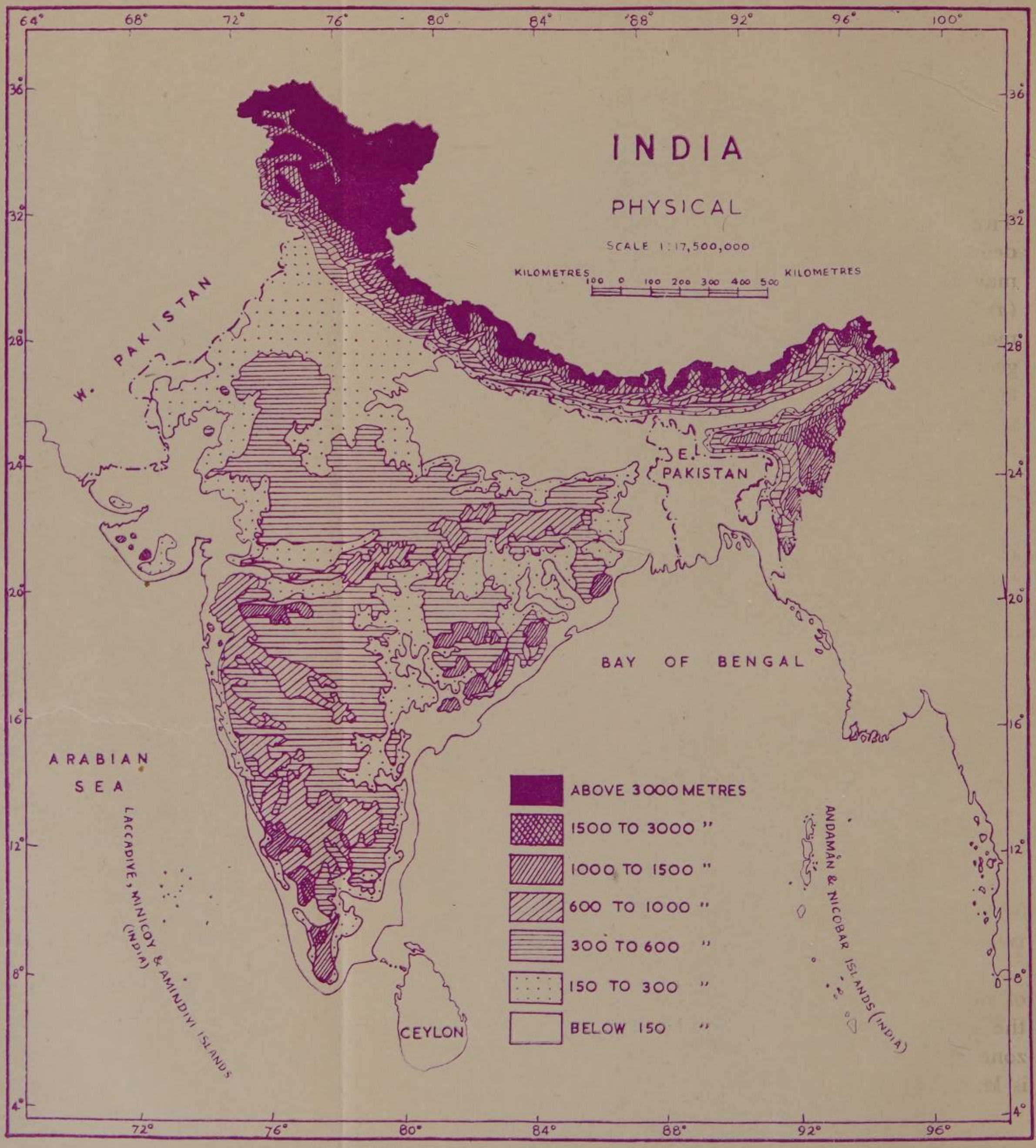


BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

A — Jammu & Kashmir; **B** — Himachal Pradesh; **C** — Punjab; **D** — Uttar Pradesh; **E** — Bihar; **F** — West Bengal; **G** — Assam; **H** — NEFA; **I** — Nagaland; **J** — Manipur; **K** — Tripura; **L** — Orissa; **M** — Madhya Pradesh; **N** — Rajasthan; **O** — Gujarat; **P** — Maharashtra; **R** — Mysore; **S** — Andhra Pradesh; **T** — Madras; **U** — Kerala.

Map 1 **India—Physical**


INDIA
PHYSICAL
SCALE 1:17,500,000
KILOMETRES 100 0 100 200 300 400 500 KILOMETRES
W. PAKISTAN
E. PAKISTAN
BAY OF BENGAL
ARABIAN SEA
LACCADIVE, MINICOY & AMINDIVI ISLANDS (INDIA)
CEYLON
ANDAMAN & NICOBAR ISLANDS (INDIA)
ABOVE 3000 METRES
1500 TO 3000 "
1000 TO 1500 "
600 TO 1000 "
300 TO 600 "
150 TO 300 "
BELOW 150 "
64° 68° 72° 76° 80° 84° 88° 92° 96° 100°
36° 32° 28° 24° 20° 16° 12° 8° 4°

BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

CHAPTER I

PHYSIOGRAPHY

THE INDIAN SUB-CONTINENT is a geographical realm very well defined by the mountains and the ocean surrounding it. It may be broadly divided into three large physiographic units—(*a*) The Peninsular massif of ancient crystalline rock; (*b*) the mountain system in the north, composed of rocks of different geological ages, where the rocks have experienced folding and faulting; and (*c*) the alluvial lowland, between the northern mountain system and the peninsular shield, where a structural trough (a geosyncline) has been filled up with transported material from the adjoining areas, especially the northern mountain system.

THE PENINSULAR PLATEAU

This has been one of the stable surfaces of the earth's crust. For over 600 million years it has been a land surface exposed to the atmosphere; only locally, and for short periods, has it experienced submergence under the sea. It is a tilted plateau with a general slope eastwards, with the western edge forming the main watershed between the rivers flowing westwards and eastwards. Uninterrupted denudation over millions of years has made the plateau a highly dissected one; the plateau is approaching base level especially in the eastern half of the Peninsula.

This Peninsular massif of ancient crystalline rocks has, today, a surface marked by wide river valleys and flood plains with relict uplands, hills and mountains in between the river plains (*Map 1*). Valuable soils, with good depths, are to be found mainly in the river plains.

The western edge of the plateau is within 50 to 100 miles of the west coast. It is an irregular ridge-zone through which the main watershed meanders. Different sections of this ridge-zone are called by different names; generally the northern half is known as the Sahyadris while the southern half is referred to

as the Anaimalais.[1] The eastern edge of the plateau, having been the lower edge of the tilted plateau, has been cut through by wide river plains; consequently it appears as a number of isolated hilly tracts; each of these has a local name, like Shevaroy hills, Nallamalai hills and so on. This broken eastern edge joins the western edge to form the high Nilgiri complex, with many peaks exceeding 2500 meters (between 11° & 12° North lat. and 76° & 77° East Long). South of the Nilgiri section the Anaimalais (or the western edge) continue for another 300 kms. High peaks exceeding 2500 meters, occur in this part of the Anaimalais also. Actually outside the Himalayas the highest peaks occur in the Nilgiri-Anaimalai region.[2]

The peninsular plateau is very important from the economic point of view; because of its dissected character there is scope for developing multi-purpose projects; this shield area possesses valuable economic minerals as the other shields in the world do.

The Northern Mountains

The mountains that border India in the north are the product of tangential thrusts, in the crust of the earth, derived from further north (Tibet and beyond), which resulted in folding, faulting and uplift of the sediments that largely compose them.[3] This region had been under the sea for a considerable period of its history experiencing successive marine depositions before it was pushed towards the peninsular massif. They are very high ranges interspersed with large and small plateaux and valleys[4] ; ranges have

---

[1] This ridge-zone is often referred to as the Western Ghats; according to the author, this is incorrect. The Western Ghats actually refer to the various passes in ridge-zone, *e.g.* Pal Ghat, Agumbhe Ghat, Amba Ghat, Bhor Ghat and so on.

[2] Hill resorts like Ootacamund, Coonoor and Kodaikanal belong to this region, attracting large number of people from the hot plains during the summer months.

[3] There is another view that the northern land mass was stationary while the Deccan Peninsula moved northwards and eastwards (*Editor*).

[4] Some of these valleys, like Kashmir and Kulu valleys, are quite extensive and fertile; they have great scenic beauty and attract tourists.

Plate 1. EASTERN HIMALAYAS — EVEREST AND OTHER PEAKS

(*see page 2*)

Plate 2. LANDSCAPE IN KASHMIR

(*see page 5*)

a general east west trend. The mountainous area, as a whole, extends to over 2000 kms. and has a width 400 kms. ; some of the highest peaks in the world are to be found here.

These northern mountains are of very great importance to India ; they influence the climate, provide water to the plains, possess valuable vegetation and animal life.

The Alluvial Lowland

Extending over 400,000 sq. kms. this area must have been once a deep trough (geosyncline) ; the rivers derived from the northern mountains have filled up the trough with enormous quantities of alluvial deposits. The thickness of the alluvium varies from 300 to 3,000 meters, giving us some idea of the original trough. The western sections of the plain have also wind-blown material mixed up with the river-borne alluvium; the eastern section is essentially made up of river-borne alluvium. This extensive lowland is remarkable for the absence of local variations in relief; to an observer it looks much like a flat surface extending right up to the horizon. The slope towards the east, from Delhi to Calcutta, is so gentle that there is less than 12 cms. drop for each kilometer.

The alluvial plain is significant in the Economic Geography of India. By its very nature it has made possible the development of settlements with easy communications between them; the deep and extensive soils, fertile and workable, have been the foundation of the growth of settlements connected by an easy communication system ; the topography and the soils have encouraged agricultural production from early times in the history of this country.

CLIMATE

The shape of the Indian sub-continent and its position just north of the Equator, partially surrounded by the arms of the Indian Ocean and backed by the high Himalayas, has great significance in explaining the nature of the climate experienced by this area. The water body around the peninsular India provides the moisture for the considerable precipitation over land in the

sub-continent; it also helps in moderating the temperature conditions especially along the coastal tracts. The northern mountains check the spread of cold continental air from the Interior Asia over the sub-continent and thereby make the winters comparatively mild. The area south of 20 degrees North latitude might be considered as the peninsular part of the country.[1] The peninsular part has, generally, high temperature throughout the year, with low to moderate annual range of temperature; the continental part has a high annual range of temperature with distinct summer and winter seasons.

With practically no winter in the peninsular part and only a mild one in the continental part, temperature conditions are helpful for the growth of vegetation all over the sub-continent for the whole year; only in the very high altitudes in the northern mountains do the winters discourage continuous plant growth—such tracts would form less than 1% of the total area of the land. While temperature conditions are so helpful all over the country, precipitation is not so. Distribution of precipitation is very uneven both areally and seasonally. Consequently the importance of precipitation in Indian Economic life is very significant.

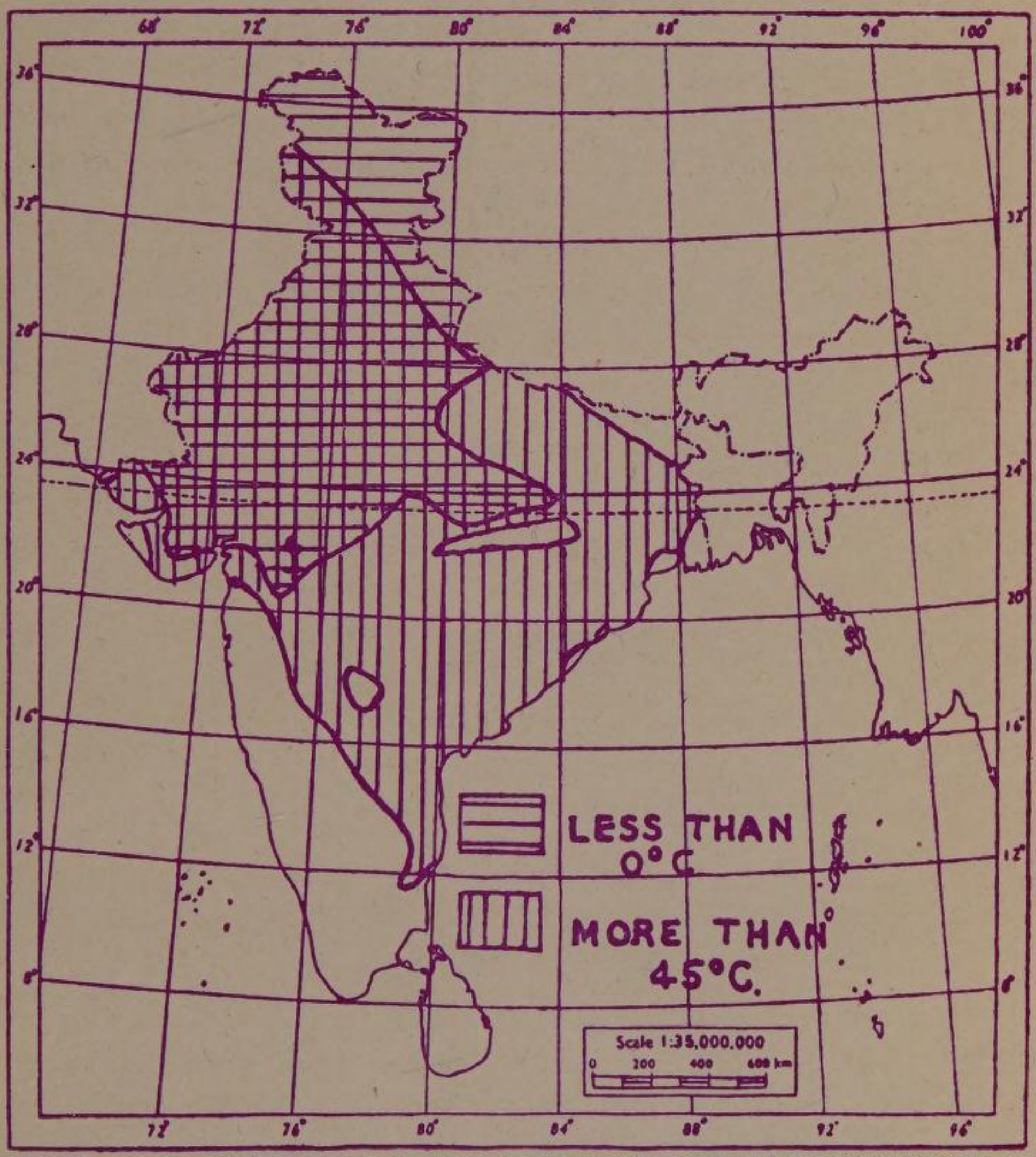
On the basis of temperature and precipitation conditions three seasons in a year are normally recognized for the country as a whole. These are:

(*a*) Hot dry season—end of March to end of May.
(*b*) Warm (or cool) dry season—middle November to about middle March.
(*c*) Warm (or cool) wet season—June to middle November.

These seasons vary in their duration from year to year and place to place. Furthermore they are not applicable to the South East (mainly Madras State) and the North West (mainly Jammu and Kashmir), where there is good amount of precipitation during the

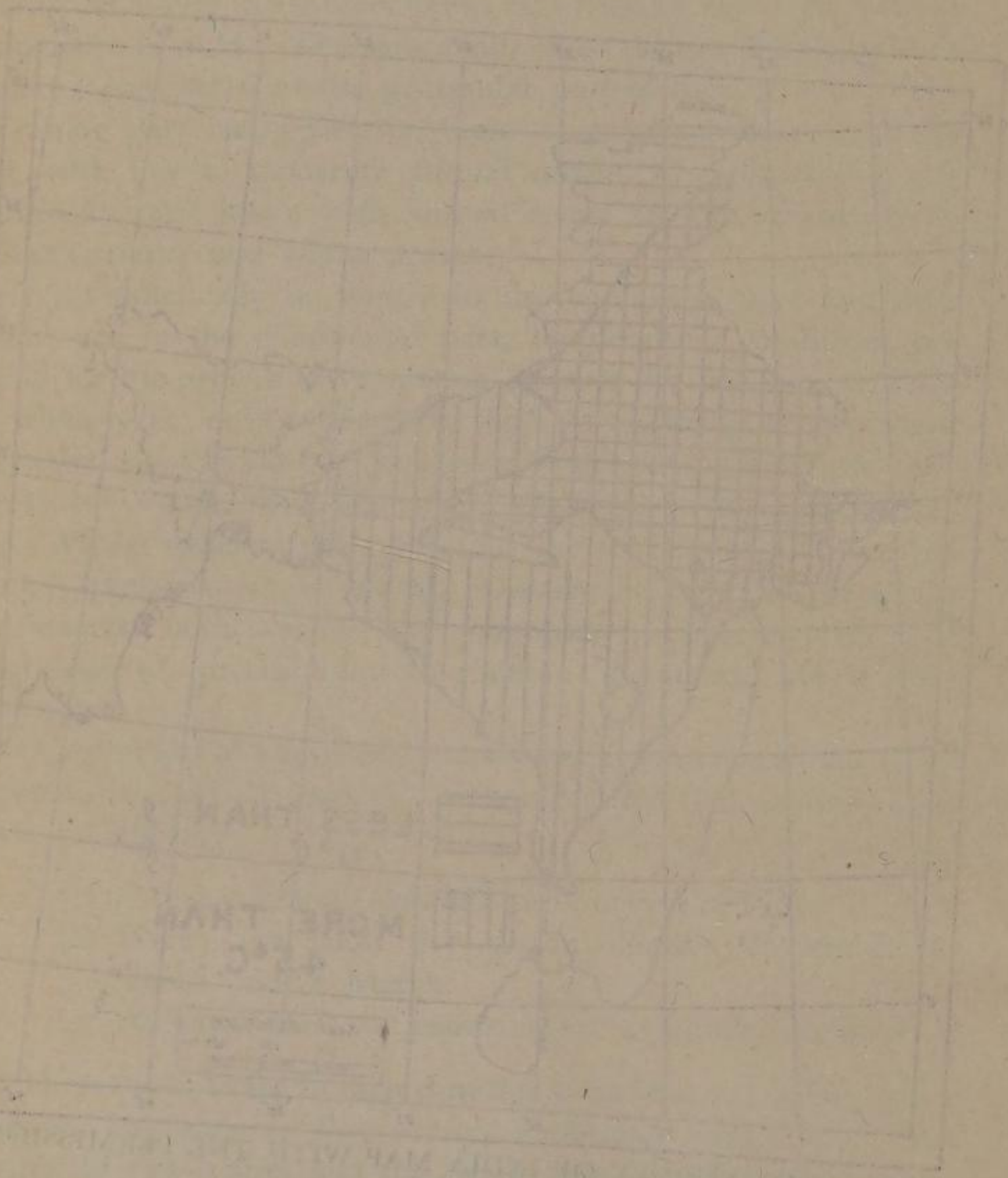
[1] The 20° N. Lat. has been suggested arbitrarily; the East-West extent along this latitude is roughly 1500 kms.; most of the peninsular India is to the south of this latitude.

Map 3 India—Areas of Highest and Lowest Temperatures Recorded

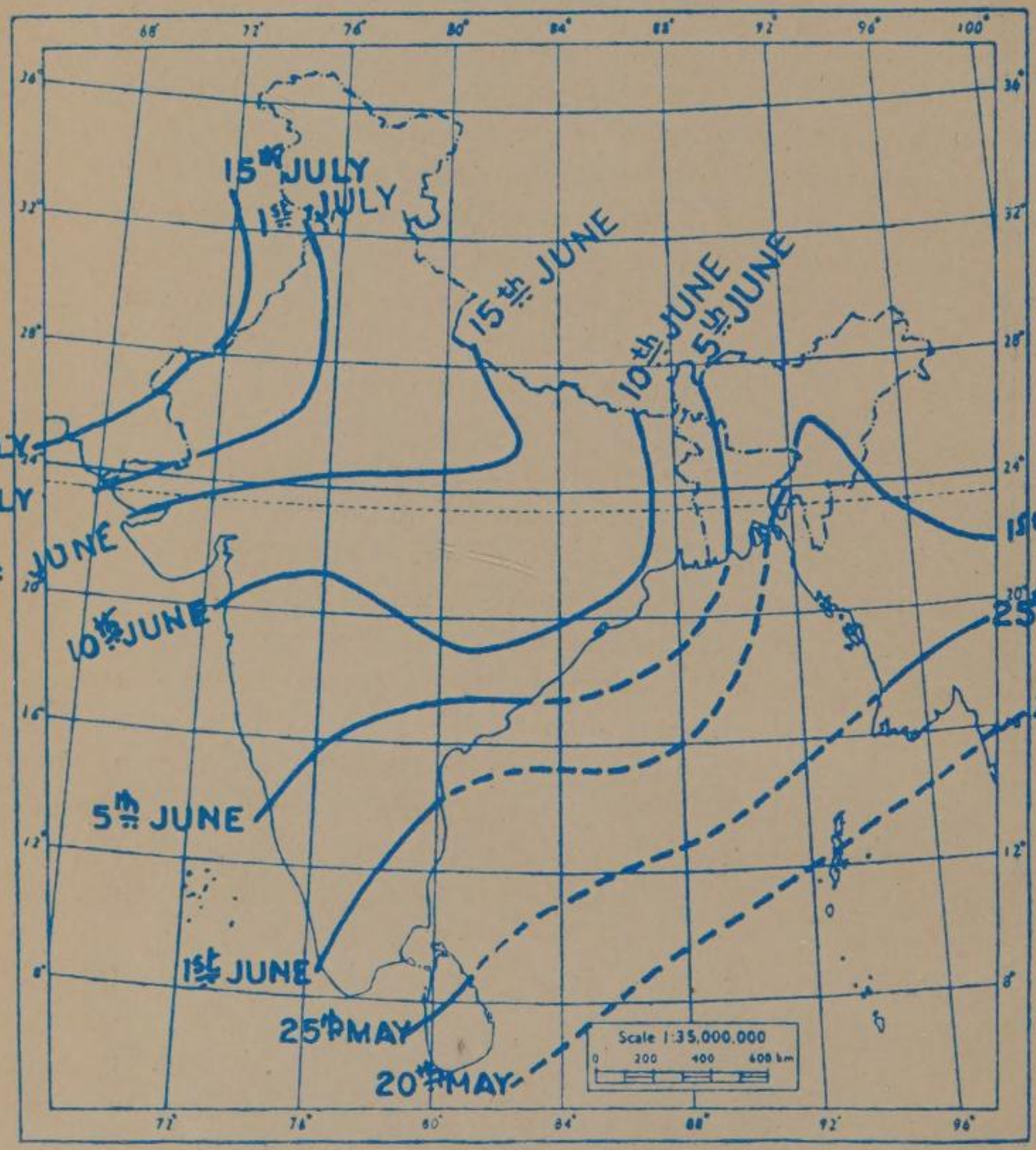


BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.



Map 4 India—Approximate Dates of the onset of Monsoons



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

September-January period. The year-to-year variation (that the same place could experience) is due to the changes in the time of the onset of the monsoon[1] and the time of the end of the monsoon; the variation could be as much as two to three weeks above or below the normal duration. In addition to this there is also the variation in the duration from place to place; this is because the rainy season starts earlier in the south and moves northwards (*Map 4*) and ends later in the south than in the north; so the total duration of the rainy season is greater for the southern stations, particularly those in the Kerala state, than for the northern ones. During the rainy season, the limits of which are not easily recognizable, the precipitation does not occur all the time; invariably days without rains occur between periods of continuous or intermittent rainfall.

The distribution of precipitation, in terms of quantity, is very uneven; very high precipitation (over 300 centimeters annual average) is experienced in the southern slopes of the Khasi Jaintia Hills of Assam, the southern slopes of the Assam Himalayas and the western slopes of the Sahyadri and Anaimalai ranges in the western Peninsular India (*Map 5*). Very low precipitation (less than 40 centimeters annual average) is experienced in the western Continental India (in Kutch and western Rajasthan) and northern Kashmir (the Ladakh, Baltistan and Gilgit). Between these extremes precipitation varies over the rest of India within the 40 cms. to 300 cms. range. Most of the precipitation is derived from moisture-laden air moving over the sub-continent from the Bay of Bengal and Arabian Sea; this movement is caused by the creation of a comparative low pressure axis over the central parts of the country as a result of the increasing insolation over land during the previous hot dry season; the low pressure area is itself a vibrating one and is not stationary. The northward moving mass of air approaches the southern tip of the peninsula sometime late

---

[1] The Arabs seem to have introduced the term 'monsoon' when referring to the periodical movement of the air across the Arabian Sea. Today most people, including Geographers and Meteorologists, use the term for referring to the season of precipitation.

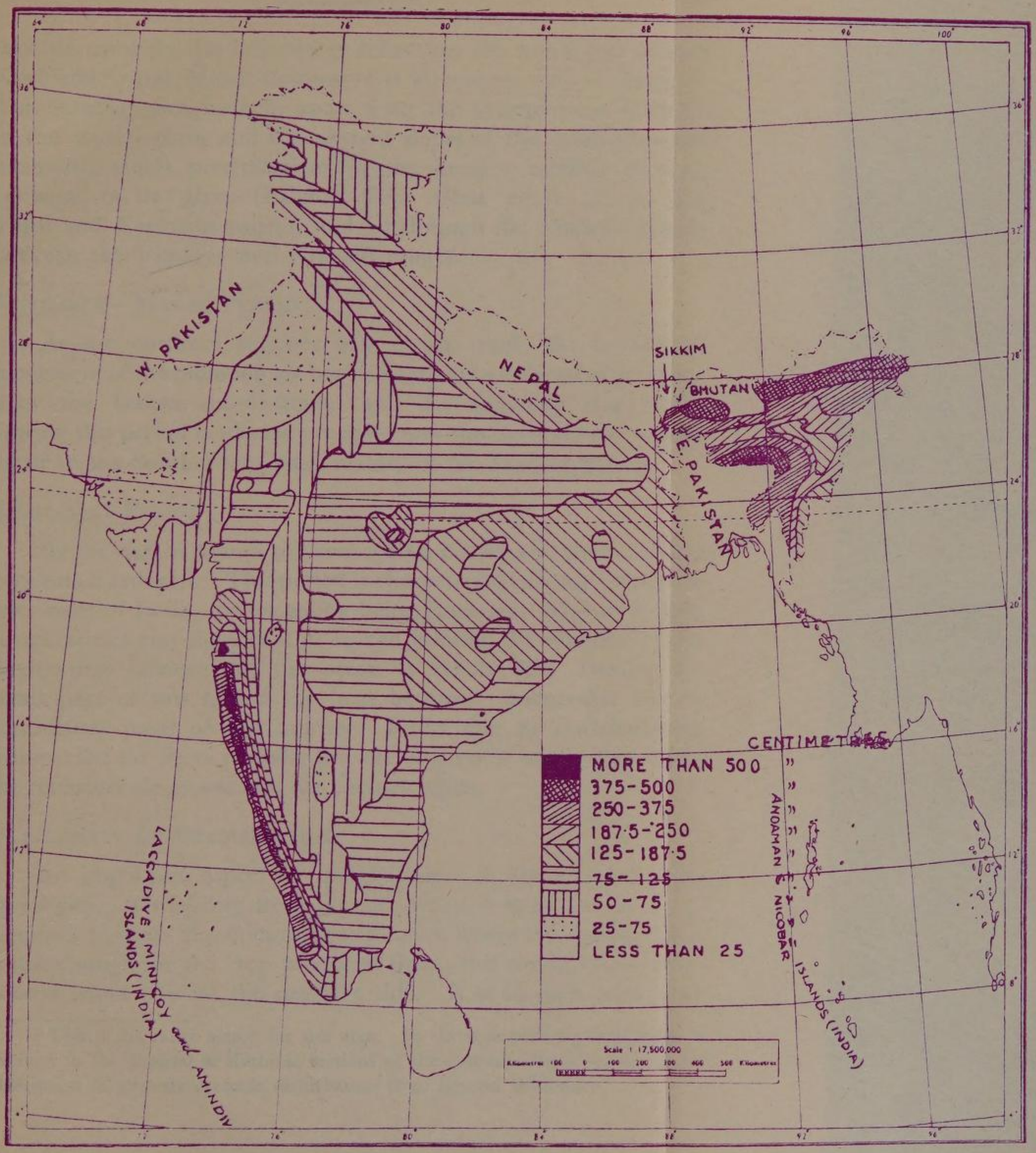
in May and moves further north in two distinct branches—the Bay of Bengal branch and the Arabian Sea branch (*Map 4*). About a week later, normally, the monsoon reaches the Bengal coast and the Bombay coast; after another week it could be expected in the middle Ganga Plains and the Kathiawar coast. Such a steady progress, though it represents the mean usual conditions, however, is not seen every year.

The Bay of Bengal branch passes over the Ganga-Brahmaputra Delta and approaches the Khasi Jaintia Hills transverse to their trend. The moisture-laden air is funneled up the numerous valleys on the southern flanks of the Hills. As the air is forced up the valleys it yields heavy precipitation in the upper slopes. Cherrapunji, situated in one such valley, is one of the wettest places in the world with an average annual precipitation exceeding 1,100 centimeters. Of the mass of air approaching north-eastern India from the Bay of Bengal only a part strikes the Khasi Jaintia Hills; another part, west of the 90 degree East longitude, reaches the southern slopes of the Himalayas between approximately 86 and 90 degrees East longitude. Part of this air mass moves westwards up the Ganga Plains while some of it moves eastwards up the Brahmaputra Plains. Still another branch moves over the saddle between Khasi Jaintia and Naga Hills to yield precipitation in the Abor and Mishmi Hills of Assam Himalaya. The southern slopes of the eastern Himalaya, thus, receive heavy precipitations. Precipitation spreads westwards along the southern slopes of the Himalaya, though in decreasing quantities, right upto Kashmir.

The Arabian Sea branch of the monsoon approaches the western coast of the peninsular India from a south westerly direction; after passing over the Kerala and Konkan coastal plains it is forced up the western slopes of the Anaimalai and Sahyadri ranges; considerable precipitation is derived in the upper slopes, especially 500 to 1500 meters altitudes. Precipitations on the leeward side of the Anaimalai and the Sahyadri are low and show an abrupt change in quantity from the nearby windward side stations. Some of the heaviest precipitation occurs in the zone of 500 to 1500 meters altitude between 11 and 18 degrees north

Map 5

India—Mean Annual Rainfall



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

latitude, roughly the latitude of Nilambur (50 kilometers east of Kozhikode) and Mahabaleshwar (70 kilometers east of Bankot). This Arabian Sea branch, apart from the precipitation it yields in the coastal plain and the western slopes of the Anaimalai and Sahyadri, yields precipitations in the interior moving through (*a*) some of the ghats (Palghat, Bhor Ghat etc.); (*b*) up the Tapti and Narmada valleys, and (*c*) through the Malwa uplands between the Vindhya and Aravalli ranges.

November—March Period

As the northern summer gets to an end the northward movement of the monsoon air begins a retreat; a reversal of pressures over the Indian sub-continent and the adjoining seas begin. During this period moderate precipitations through cyclonic storms, occur in the South East Coast, mainly in the Madras State.[1]

April-May Period

By the end of March the cool season is over and the rains also very much reduced. This period is characterized by dry conditions over most of India, the exception being Kashmir. Day and night temperatures rise significantly; in the interior the absence of the moderating influence of the ocean is keenly felt. During the latter part of this period the heat becomes unbearable in the continental parts of the country. Rains due to thunderstorms bring relief for short periods; but the real relief comes only when the monsoon air moves into the country again.

Variability of Precipitation

An important aspect of precipitation in the country is its variability. Variability from normal, when it is as low as 10%, is serious in areas of moderate precipitation where the precipitation is just enough for the crop produced there; this would be so particularly when it is on the negative side. It is in such areas that

---

[1] This is the rainy season for this area. In the same period precipitation is received in the Jammu & Kashmir sections of the country; these are due to the penetration of westerly cyclonic disturbances from beyond Pakistan.

famines occur. In the rainfall map (*Map 5*) the area covered by the vertical lines in the peninsular and western India show the parts of the country where famines occur rather frequently; this is the area where precipitation, normally, ranges from 50 to 75 centimeters; this is the area where variability ranges from 20 to 30% (*Map 6*).

High variability, over 30%, is characteristic of the western section of the continental India where precipitation is moderate to very low; because of the low precipitation land-use is based on irrigation facilities or "risk" basis. Precipitation below the normal in any year, consequently, does not take the people unawares; precipitation above the normal is a pleasant surprise. On the other hand, low variability below 15% is characteristic of areas of high precipitation (*Map 5*); even though the percentage is low the actual quantity below or above normal could be high because of the high normals for these areas. Here precipitation below the normal, in any year, is not unwelcome, but precipitation above the normal, even to the moderate extent of the variability, could be unhelpful because the total quantity increases above the high normals and tends to inundate vast areas.

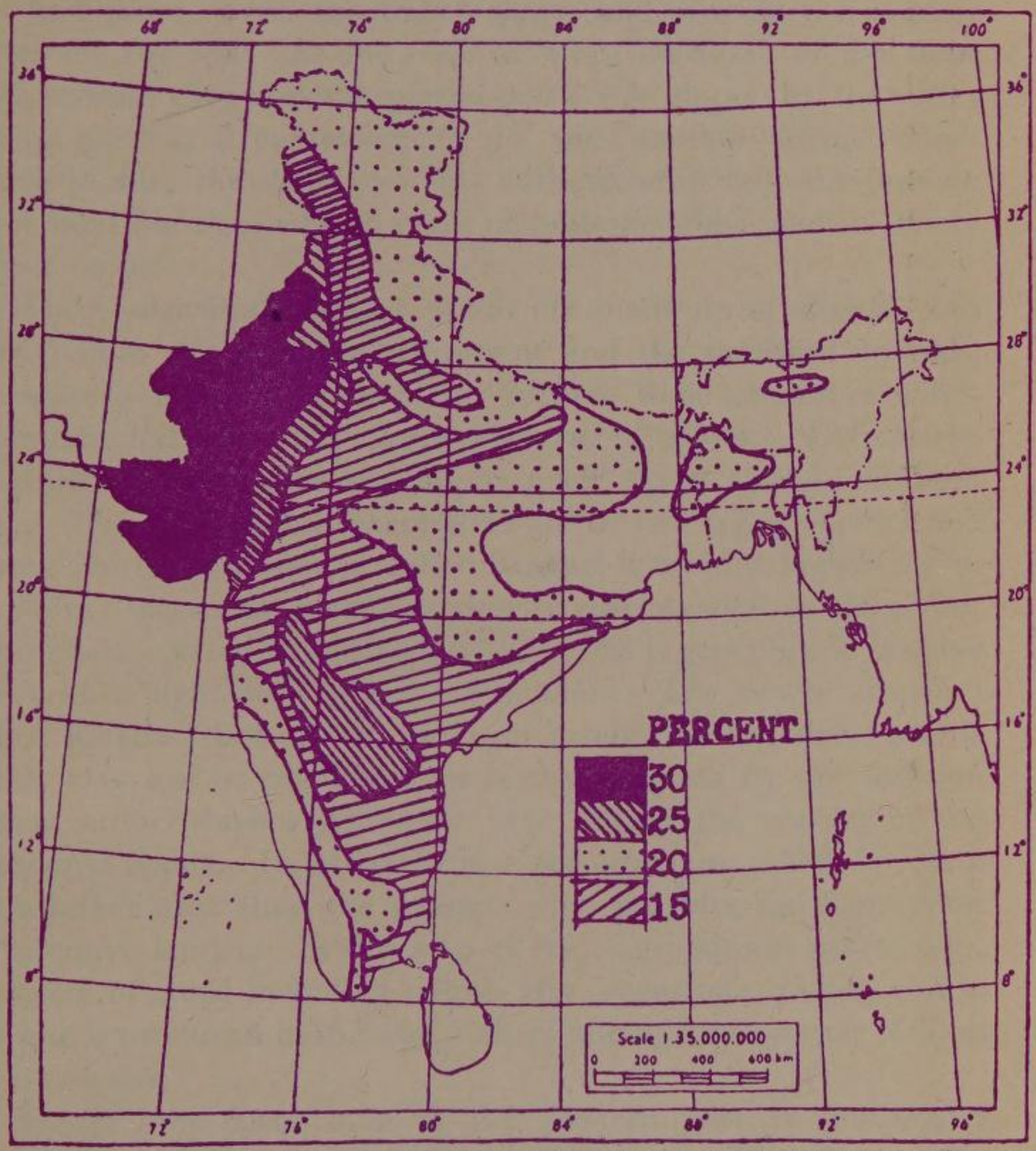
GEOLOGY AND SOILS

It is possible to divide the whole country into four broad areas on the basis of the rock-dominance.

(*a*) The northern mountains with sedimentaries and metamorphosed rocks;
(*b*) The Ganga-Brahmaputra plains where the underlying rocks are completely concealed by thick alluvial deposits ;
(*c*) The lava-covered (trap) part of the peninsular plateau; and
(*d*) The peninsular plateau composed of various types of rocks, mostly crystalline.

In these areas, excluding the Ganga-Brahmaputra plains, soils are generally developed on the dominant surface rocks with the

Map 6 India—Variability of Rainfall



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

aid of climatic and vegetational factors. In the Ganga-Brahmaputra plains, however, the soils are transported ones derived from beyond this area.

The soils of the northern mountains are largely forest soils, including Podzols, developed under temperate humid conditions; oaks and pines cover the higher slopes and provide the organic matter for the soil. As the soils develop, because of the slope in the terrain, they are transported down the slopes to the valley bottoms and, as a consequence, do not develop distinct zones in their profile; the valley bottoms with accumulated soils provide useful land for rice, wheat, some plantation crops and a variety of fruit crops.

The Ganga-Brahmaputra plains are made up of alluvial soils derived from the northern mountains and the southern uplands. The western one-third of the plains include some amount of wind-blown material mixed with the river-borne alluvium. The eastern two-thirds of the plains are largely made up of river-borne alluvium. The alluvial soils themselves are of two types — older and newer. The older alluvium (called Bangar) is usually higher up in the plains, occurring mostly as river-terraces away from the rivers, and is characterized by calcareous clays; this is generally in massive beds with a light grey or ash grey colour. The newer alluvium (called Khadar) belongs to the lower levels near the rivers and is mainly clay loams; this alluvium is characterized by the addition of new surface layers year after year during the seasons of the monsoonal floods. In general the older alluvium, which covers a much larger area than the younger one, provides the foundation for intensive land use in this area of high agricultural production. A variety of crops including wheat, rice, sugarcane, pulses, cotton and jute is produced in this vast area of about three quarter million sq. kilometers.

Desert soils cover most of the western part of continental India, most of Rajasthan and parts of Gujarat. These are sandy soils, alkaline in character; the soils are poor in organic matter and are porous. The area under these soils, about one quarter million sq. kilometers, is covered with scattered patches of poor

scrub vegetation.

Black soils[1] are characteristic of the north western third of the peninsular plateau; these have been developed on the basalts that cover this area. The soils are deeper in the river valleys and thinner in the upland portions. These soils are clayey and derive their colour from the clay-humus complex. Clay, silt and sand are formed in these soils. Clay dominates the surface layers, while sands increase in lower layers. Percentage of clay in surface layers may be 45-60. These soils are generally very useful for cereal crops, oil-seeds and sugarcane.

Red soils cover a large part of the peninsular plateau—Andhra Pradesh, Mysore and Madras states. These soils are developed on the crystalline rocks of the area and have a mixture of clay and sand; most of these soils are loams deriving their colour from "ferric oxides occurring as their coatings on the soil particles." The soils are poor in organic matter and provide easy movement of moisture through them. In the uplands they are useful for growing millets, while in the river plains they help cultivation of cereals, oil seeds, and sugarcane.

---

[1] Most of Maharashtra State and adjoining portions of Gujarat, Madhya Pradesh, Andhra Pradesh and Mysore.

CHAPTER II

NATURAL RESOURCES

THE NATURAL RESOURCES of the country may be considered under four broad heads, *viz*., Mineral, Plant, Animal and Human.

MINERALS

The mineral resources of the country are considerable and varied enough to provide for sound economic development of the country. Some of the very important items available in very large quantities, are iron-ore, aluminium-ore, titanium-ore, manganese and mica. Other minerals are not in such large quantities, and the country must utilise them with great care based on sound planning.

Bulk of the valuable minerals and metals obtained in India are products of pre-Palaeozoic age and are mainly associated with metamorphic rocks of the peninsular plateau. The distribution of the minerals is quite uneven; some states are very important (Bihar and Orissa) while some are relatively unimportant (Uttar Pradesh and the Punjab). The state-wise distribution of the more important minerals may be indicated as follows[1]:

State	*Minerals (important ones only)*	*Value of all minerals produced (approximate) every year (Million Rupees)*[2]
Andhra Pradesh	Coal, Mica	91
Assam	Petroleum	23
Bihar	Bauxite, Coal, Iron, Mica	622
Gujarat	Bauxite, Petroleum	60
Kerala	Ilmenite	14
Jammu & Kashmir	—	2
Madhya Pradesh	Bauxite, Coal, Iron, Manganese, Limestone	208

[1] Source: *Statistical Abstract of the Indian Union, 1962*, Central Statistical Organisation, Department of Statistics, Government of India.

[2] Excludes value of petroleum and minerals prescribed under Atomic Energy Act, 1948.

1	2	3
Madras	Ilmenite, Limestone	26
Maharashtra	Bauxite, Manganese	63
Mysore	Gold, Iron, Manganese	81
Orissa	Iron, Manganese	108
Punjab	—	3
Rajasthan	Mica	61
Uttar Pradesh	—	22
West Bengal	Coal	361

Bihar state takes the first place in the variety of important minerals it produces and also in the total annual value of the minerals produced. For two items, Coal and Mica, it holds the first place among the states in the country for annual value of production; for Bauxite it holds the second place and for Iron the third place. After Bihar, from the point of view of variety of important minerals produced, Madhya Pradesh and Orissa take the second and third places; but, from the point of view of the value of annual production, West Bengal takes the second place after Bihar because of the large quantity of coal it produces annually. After these four states Andhra Pradesh, Mysore, Maharashtra, Rajsthan, Gujarat and Madras are also important producers of minerals; each of these has an annual production exceeding, in value, 25 million rupees.

Since the distribution of the important minerals is uneven even within the states themselves, it is possible to roughly mark out areas of high mineral productivity, ignoring state boundaries. The most important of these is one (*a*) that includes parts of Bihar, Orissa and West Bengal associated with the north eastern part of the peninsular plateau. A second one (*b*) includes parts of Madhya Pradesh, Andhra Pradesh and Maharashtra; and a third one (*c*) spreads over Mysore, Andhra Pradesh and Madras. There is one (*d*) extending from south eastern Andhra Pradesh to northern Madras; finally there is one (*e*) including parts of Rajasthan and Gujarat. A large number of the heavy industries belong mostly to these areas.

The following is the nature of distribution of minerals in the five areas mentioned in the previous para :

(*a*) Bihar-Orissa-Bengal	Coal, Mica, Bauxite, Iron-Ore, Limestone, Copper, Manganese and Chromite.
(*b*) Madhya Pradesh-Andhra Pradesh-Maharashtra	Manganese, Iron-ore, Bauxite, Limestone and Coal.
(*c*) Mysore-Andhra Pradesh-Madras	Gold, Iron-Ore, Manganese, Chromite and Copper.
(*d*) Andhra Pradesh-Madras	Mica, Lignite and Manganese.
(*e*) Rajasthan-Gujarat	Petroleum, Manganese, Mica, and Precious stones.

Other important areas that should be mentioned are north-east Assam where petroleum is produced and the far south (Kerala-Madras), where monazite occurs in the beach sands in association with ilmenite.

The estimated reserves of iron-ore in the country exceed 20 billion (20,000, million) tons; this is about 22% of the world's reserves. The most valuable ore varieties are Haematites and Magnetites with 60-65% metallic content. Most of the annual output, 12 to 14 million tons, is consumed within the country; there is, however, some export to Japan. Along with the large reserves of good quality iron-ore the country also possesses very large reserves of Manganese, which is used for hardening steel[1] ; the estimated reserves of high grade ores, containing over 48% Manganese, are between 20 and 25 million tons; low grade ores with less than 48% Manganese occur widely and the reserves may be as much as 50 to 60 million tons. The annual output is about 1.5 million tons of which about a million tons are exported. Brazil, India and the Soviet Union are the three largest producers of Manganese in the world.

---

[1] Manganese has also many other uses in the chemical, electrical and glass industries.

Muscovite is a widely distributed mineral in the crystalline rocks of the country; it yields the valuable Mica. India is the first producer of Mica in the world contributing between 60 and 75% of the world's requirements. The Indian deposits of this valuable mineral are considered to be the finest in the world; they yield large and good crystal plates. About three quarter of a million cwts. of mica are exported annually realizing about 150 million rupees. Mica is useful as an insulating material in electrical goods and is being increasingly used for the making of Micanite; very small bits, or scrap, of Mica are ground for making paints, lubricants etc.

Bauxite occurs in the country in a number of places. It is found in the laterites which are widely distributed in the peninsula. The laterites containing high grade bauxite are found in Bihar and Madhya Pradesh; these bauxites have an Alumina content of 50 to 58%. The reserves of high grade ore are estimated to be about 30 million tons; the total reserves of all varieties of bauxite might be as much as 250 million tons. The annual output of metallic Aluminium in the country has been about eighteen thousand tons. Besides its use as a source of the metal aluminium bauxite is also used in the cement making industry and in the refinement of oil.

Coal and petroleum are valuable power minerals. Reserves of good quality coal in the country, occurring within thousand feet from the surface, are estimated to be about 6 billion tons (6,000 million) ; of these roughly half is coking-coal; over 90% of these occur in south Bihar and the southern parts of West Bengal. At the present rate of extraction, allowing for a gradual rise in the consumption of such coal, these reserves would be used up in another eight or nine decades. Inferior coals, with less carbon content (40 to 53%), occur in Assam and the Punjab. Lignite, with low carbon content, occurs in Madras state. The reserves of such inferior coals and lignite are about 4 billion tons (4,000 million). By confining the superior coals for metallurgical purposes and the inferior ones for power production the present estimated reserves could be made to last a century at the most. If, however, mining

Plate 3. SILVER FIR FORESTS IN WESTERN HIMALAYAS

(*see page 16*)

Plate 4. A RURAL LANDSCAPE

(*see page 21*)

is extended to deeper levels and some of the likely coal-bearing Gondwana rocks below the lavas of the Deccan trap are also discovered the prospects of a longer period of self-sufficiency are good.

Petroleum resources are quite limited in the country. They are confined to the tertiary strata in the north, especially the Assam sector, and the coastal tracts, particularly Gujarat coast (Cambay-Kutch). Tentative estimates suggest a potential oil-bearing area of about ·75 million square kilometers. Since the programme of oil exploration is still in progress it is not possible to say, even roughly, the extent of sources. It is, however, believed that within a decade the country would be producing 5-6 million tons of crude oil from the Assam and Gujarat fields alone. In anticipation of increasing oil-production within the country and with a view to saving valuable foreign exchange, many refineries have been completed and are nearing completion—Bombay (Maharashtra), Koyali (Gujarat), Barauni (Bihar), Nunmati (Assam) and Vishakapatnam (Andhra Pradesh) are some of the centres for refining. The refineries are fed with imported crude oil in addition to Indian crudes.

PLANTS

Peninsular India lies wholly in tropical latitudes while the continental part is largely confined to sub-tropical latitudes. Outside the high Himalayas no part of the country experiences low temperatures, below the freezing point. With helpful temperature conditions and heavy monsoon precipitations the country must have had, many years ago, considerable areas under forests and grasslands. Such natural (without human interference) vegetation has been largely wiped out now; such natural vegetation is limited, today, to small patches that are too inaccessible to man or too barren for profitable exploitation; total area of such natural plant cover must be less than 5% of the geographical area of India.

In a consideration of natural plant resources forests and grasslands that have had human guidance in their development are important. Not more than 25% of the total geographical

area of the country is under forests and useful grasslands. About 0.8 million square kilometers are under forests and a little less than 0.1 million square kilometers under grasslands. Actually the small area under useful grasslands belong to the forests and their fringes, mostly in sloping terrain. Of the forests a little over 30 thousand square kilometers are under coniferous type while the remaining area, about .77 million sq. kilometers, is under broad-leaved type. The forests are important because they yield timber and firewood; indirectly they have great value because they prevent soil erosion and have some influence on temperature and precipitation conditions.[1]

On the basis of data available for recent years the annual value of forest produce is approximately 500 million rupees. The more important uses of the forest produce are as follows :

(1) Structural timber
(2) Wood for making furniture
(3) Pulp and match wood
(4) Fire wood
(5) Wood for making charcoal
(6) Gum and resins
(7) Canes
(8) Fibres and flosses.

The distribution of forests is very uneven; in some states (Assam and Orissa) more than 20% of the area is under forests; in some states (Punjab and Rajasthan) less than 3% of the area is under forests. This uneven distribution is largely due to the uneven distribution of precipitation; areas of high precipitation alone are capable of having forests. Five types of forests can be recognised as below :

(a)	*Evergreen rain forests* Western-ridge zone of the peninsular plateau and southern sections of Assam-Bengal Himalayas.	Precipitation over 200 centimeters annually.	Teak, Rosewood, Bamboo (hard woods), Sal.

[1] They are also important for the animals that belong to them; to preserve wild life in the country it is absolutely necessary to prevent depletion of forests and grasslands.

(*b*)	*Deciduous monsoon forests* Peninsular hills, central and western sections of Himalayas.	120 to 200 centimeters annually.	Teak, Sal, Ebony, Sandal Deodar, Bamboo (Hard woods).
(*c*)	*Scrub forests* Interior peninsular plateau, north western India.	Less than 120 centimeters annually.	Acacia, Babool, Banyan Neem.
(*d*)	*Sub-tropical and temperate evergreen forests* over 1500 meters in peninsular India and over 1000 meters in Himalayas.	Over 120 centimeters annually.	Oak, Deodar, Pine, Chestnut, Walnut, Poplar, Birch and Fir. (soft and semi-hard woods).
(*e*)	*Coastal forests* (littoral types) Larger deltas along the east coast and salt water creeks and marshes in both coasts.		Mangrove type of vegetation, *e.g.*, Sundri.

The most important product of the forests is timber; with human assistance special timber forests have been developed; they are the teak forests of the Sahyadris and the Anaimalai sections; the teak forest of the Malwa plateau, the sal forests of the north east, including Chota Nagpur plateau, Assam hills and plateaux; the sandal forests of Mysore plateau; the coniferous forests of the Kashmir, the Punjab and Kumaon Himalayas.

Schemes and projects have been undertaken in recent years to increase the area under forests; this can be done only by bringing the unutilised lands under some sort of vegetation in the initial stages. A special programme for increasing the wood required for the match, plywood, and paper industries has been started with the adoption of fast-growing species in selected areas. The aim of the government is to increase the area under forests to, at least, 30% of the total area of the country. The major difficulty in achieving this aim would be the increasing demand for food-crops, which would demand more land for cultivation.

ANIMALS

India is one of the few sovereign countries of the world which have, within their frontiers, a variety of large and small animals

reptiles, birds and other small creatures. Among the larger animals, in wild condition, it has the elephant, rhinoceros, gaur, (Indian bison), wild buffalo, yak, wild-ass, sambar, tiger, lion cheetah and bear; smaller animals include variety of deer, wild goat, hare, langur, rhesus monkeys, jackal, fox and mongoose. Of the domesticated type it has most of the animals known to the world—camel, horse, donkey, yak, cattle, sheep, goat and the like. Of the reptile family it has a very impressive variety from the pythons and crocodiles to cobras, vipers and lizards. Multi-legged creatures that crawl around, and speed about, (scorpions, centipedes, spiders, cockroaches etc.) abound in the country; all these are largely untamed and can do a lot of harm to man if he inadverdently troubles them. The distribution of the fauna is indicated below:

Region	*Climate and nature of forest*	*Animal life (not domesticated)*
(*a*) North eastern region: Parts of West Bengal, Assam, Sikkim and Bhutan.	High monsoon precipitation; high humidity; monsoon forests (dense).	Tiger, sloth bear, elephant, rhinoceros, gaur, antelope, langur, crocodile, python.
(*b*) South western region: Parts of Mysore, Kerala, parts of Madras.	High monsoon precipitation; high humidity; dense monsoon forests.	Tiger, elephant, gaur, wild bear, deer, monkey, python.
(*c*) East central region: parts of Andhra Pradesh, Maharashtra, Madhya Pradesh, Orissa & Bihar.	Monsoon precipitation; monsoon forests (not dense).	Tiger, cheetah, deer, monkey, jackal, hare.
(*d*) South eastern region: Parts of Andhra Pradesh and Madras.	Monsoon precipitation; open monsoon forests.	Cheetah, jackal, wild goat.
(*e*) Northern region: Jammu and Kashmir, parts of the Punjab and Uttar Pradesh.	Mostly moderate winter precipitation, sub tropical and temperate forests.	Tiger, fox, deer, hare.
(*f*) Western region: Gujarat and parts of Rajasthan, parts of the Punjab.	Low to moderate precipitation; scrub forests.	Lion, wild ass, jackal, swamp deer, wild goat.

With the expansion of human settlements and associated land-use the larger animals have decreased in their numbers to such an extent that some may not exist, outside the museums, after a century or two. In recent years attempts have been made to preserve wild life in selected areas—Assam, northern Uttar Pradesh, western Gujarat and Madras-Kerala border. Outside these limited reserved areas, the larger animals are loosing in their struggle against human expansion; the smaller and less conspicuous creatures, which are a greater nuisance to man, continue to thrive because of their inconspicuous nature—centipedes, cockroaches, spiders, scorpions, mice and rats seem to multiply as vigorously as the humans and claim considerable share of the economic output of the humans.

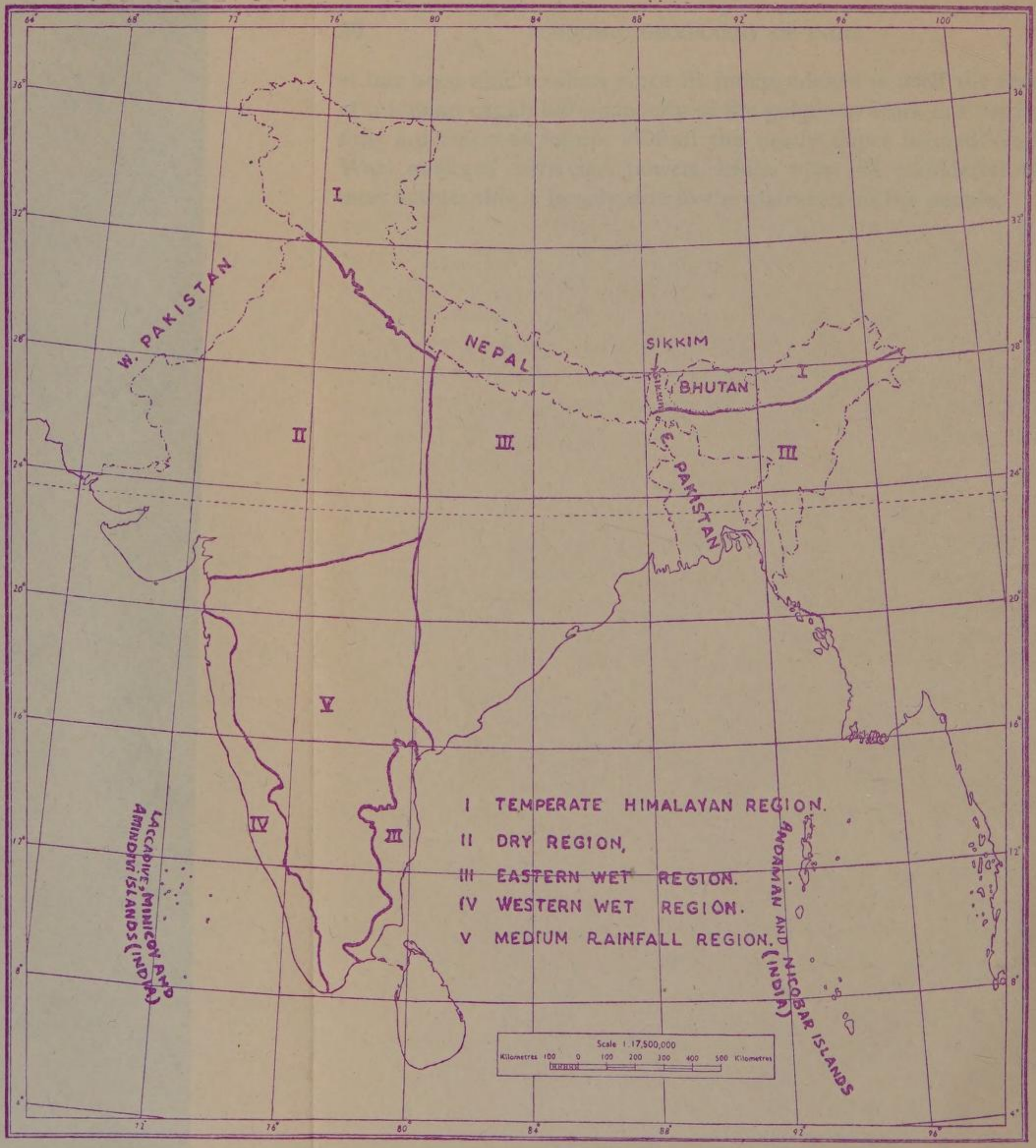
POPULATION

The population of the country has been rising at a rapid pace for quite some decades; it is about 470 millions now. One cannot honestly consider all of this humanity as a valuable aspect of the natural resources of the country. This population has two important features which make its consideration necessary in this chapter; the two features of the population are its size and its composition. There can be no doubt that the population is enormous; in addition it is made up of many religious and linguistic groups with a variety of customs and conventions based on differing historical associations. Such a population is capable of yielding valuable human material for any activity because of its quantity and quality; even if only 10% of the population is considered as superior man-power, the quantity of such superior man-power is considerable. It is this valuable part of the total population that deserves a place in this chapter dealing with natural resources.

In philosophy, art and science the country has produced some of the greatest thinkers; even in modern technology it has know-how, in Asia, second only to Japan. In other fields also the country's record has shown the high quality of some of its people in industry, defence effort and other human activity. The political stability

it has been able to show since its independence is itself the result of a human capability—capacity of the people to work out successfully a democratic set-up. Of all the newly (since Second World War) emerged sovereign powers India must be considered the most stable; this is largely due to the character of the people.

Map 7 **India—Agricultural Regions**



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

CHAPTER III

LAND-USE: FOOD CROPS

MANY THOUSANDS OF YEARS AGO "land-use" would have meant use of the land by any of the living creatures on the land—how plants used the land for their growth and expansion; how animals used land for their community life; how man used land for maintaining himself and the family, and so on. Today land-use refers only to the human utilization of land for its own benefits. One of nature's children has become the selfish and arrogant son.

Man uses land and other natural resources for providing himself with food, shelter, clothing and other comforts. In this effort the procurement of food must have been right from the beginning, the primary activity of the human being. In the early stages man, probably, plucked the fruits from the trees or caught the smaller animals that came his way for satisfying his hunger for food; as he increased in numbers he must have had to roam over larger areas to get food; this led on to a stage when the natural supply of fruits, nuts and animals could not sustain the human population. Then came human effort to produce on the same piece of land food crops year after year; to the original fruits and nuts many grains were added. Similarly the more easily tamed animals were domesticated and allowed to grow in numbers under human supervision so that there was a continuous supply of milk and meat; poultry birds and smaller animals could be kept in the backyard without much difficulty.

In the world, as well as in India, human numbers have increased steadily to such an extent that most of the land is being utilized largely to satisfy human needs. Of the many uses to which land is put the most important is agriculture; in India, where a very large part of the population consumes cereal crops as the main item of its daily meals, agriculture has been the dominant land-use for centuries. Many cereals, millets, pulses and a variety of spices and vegetables are grown year after year, often

in the same areas, to meet the increasing demand for food. In addition to these crops, which are mainly for direct consumption within the country, there are a good number of plantation crops that need processing and have higher value in international trade.

Agriculture is important not only because it provides the food for the millions in this country but also for the employment it gives to a very large section of the population. Approximately seventy percent of the people are engaged in activities that are aimed at making the land yield crops year after year. These activities result in the production of food crops and raw materials for the various industries. In the following pages of this chapter activities concerned with the production of food crops will be examined.

Of a total geographical area of 800 million acres about 376 million acres form the cropped area. Of the latter about 50 million acres are sown more than once every year. About 60 million acres of the cropped area are irrigated. A large variety of crops is produced. The cereals are the most important of these crops. The cereal grains are the edible starchy seeds of crop plants belonging to the grass family *Gramineae*[1]. Among the principal cereal grains Rice and Wheat are the most important; they are the source of concentrated carbohydrates to people. Fortunately for the people of the world (and of India) these two important cereals thrive best under different geographical conditions; they do not require the same type of geographical conditions for their optimum growth. Their distribution, therefore, shows only limited areas where they overlap each other.

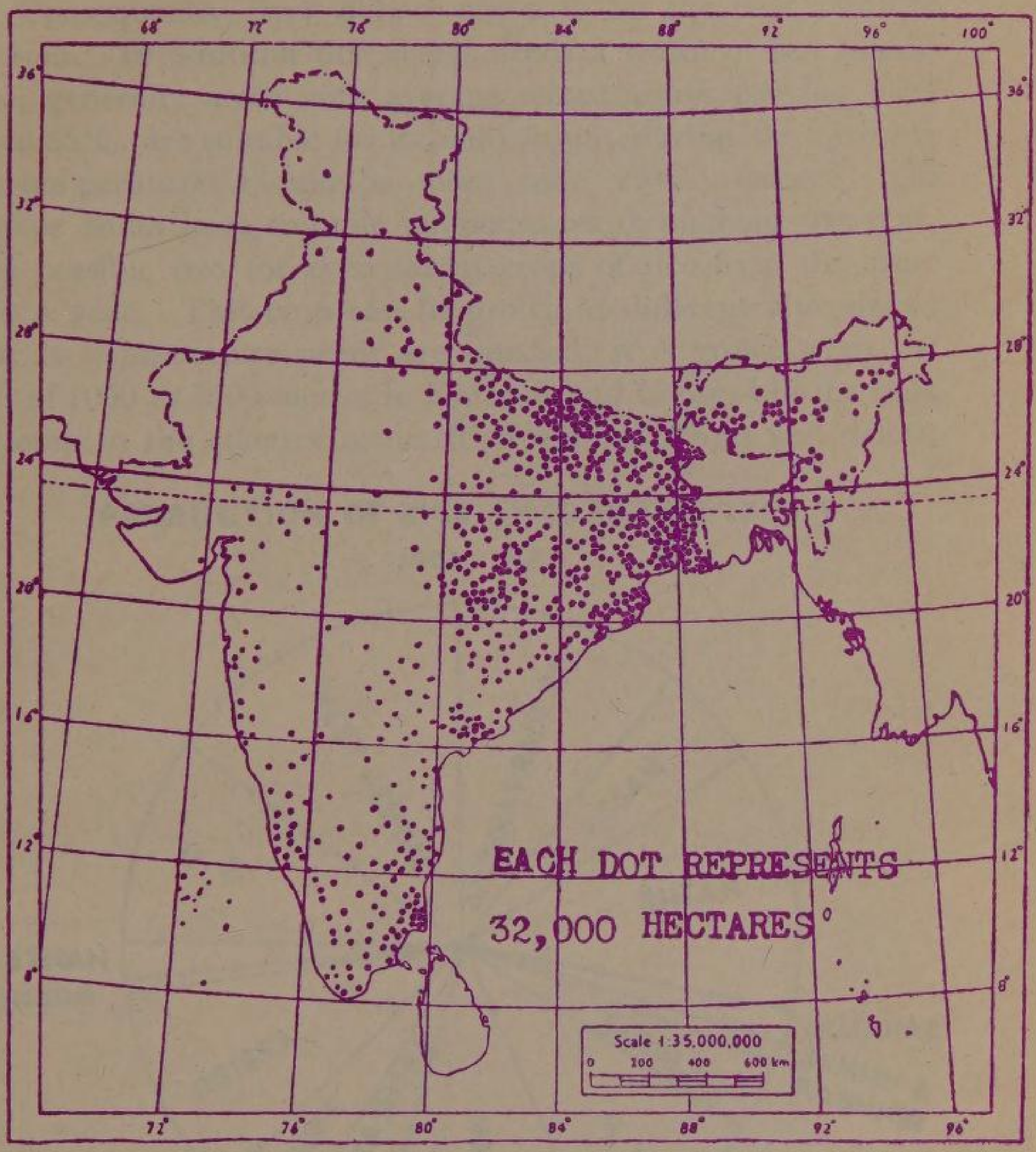
RICE

Over 90 % of the world's rice crop comes from Monsoon Asia, where it is also consumed. Among the countries included in this area, India is a major producer and consumer.

The crop requires considerable quantities of water and thrives best when there is 5 to 10 centimeters of standing water in the field during the earlier parts of its growing period. Periodical changing

[1] Strictly speaking the term 'cereal' refers to the entire plant and not only to the grain part of it.

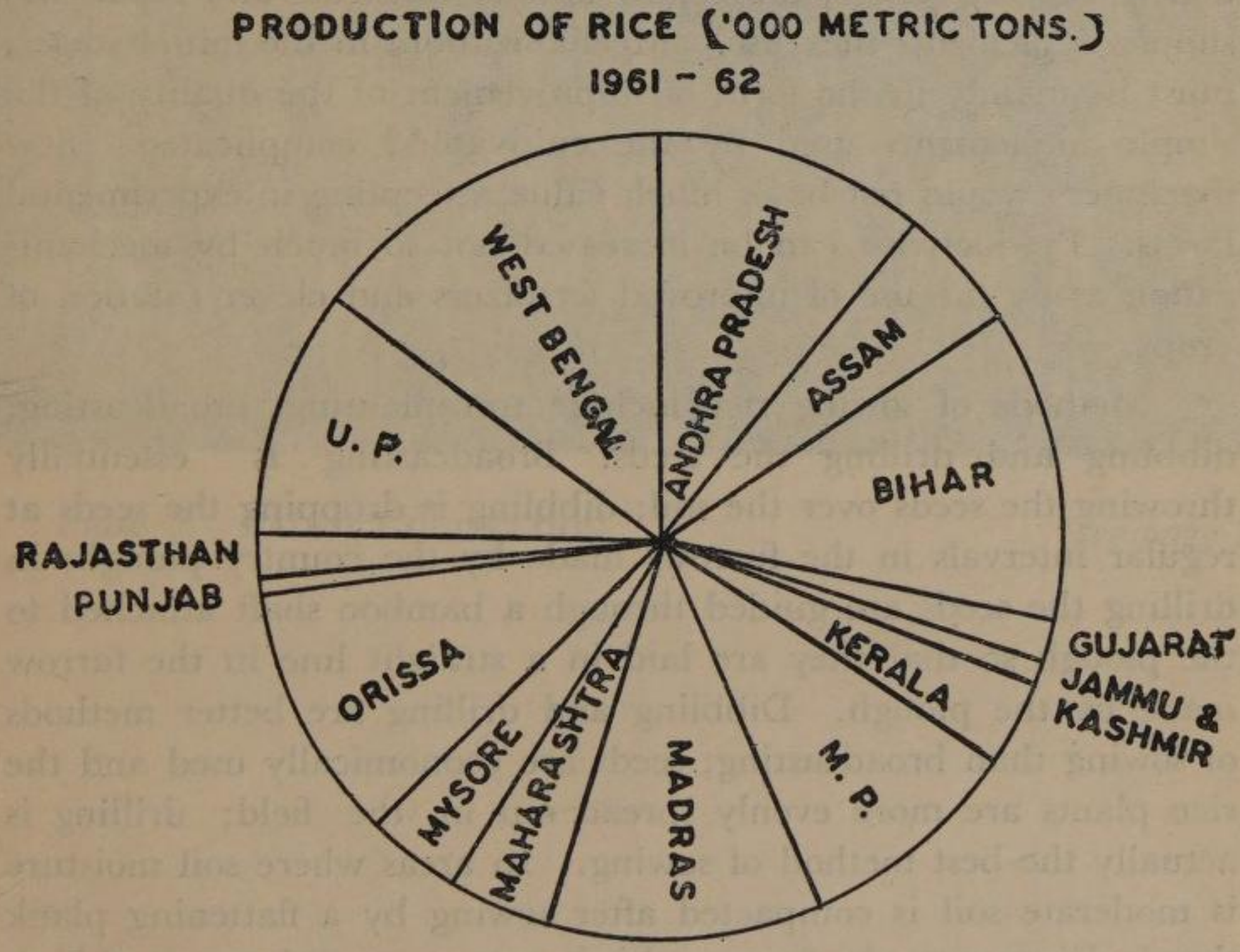
Map 8 Rice



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

of the water helps the growth. This requirement implies the need for not only large amounts of water but also comparatively flat land. Consequently river deltas[1] prove to be the best areas of production. In addition this cereal needs a warm or hot humid climate; generally areas with average temperatures ranging from 22°C. to 35°C. are suitable for its cultivation; during the growing season temperatures should be more than 25°C.; eastern and peninsular India have suitable temperatures throughout the year, making possible two (or even three) crops of rice from the same land in a year. This crop can be grown at different altitudes so long as its temperature needs are satisfied; it is grown even at heights of 1000 to 1500 metres in Kashmir and Coorg; but the bulk of the crop in the country comes from alluvial plains and deltas;



[1] Rice is also grown in some upland areas where water supply is limited and largely depends on rainfall. Such "dry" or "semi-dry" systems of cultivation are generally risky ventures and account for only a small part of the total production.

from the point of view of surface relief the important requirement is not altitude but flatness of topography.

The main rice-growing areas are confined to those parts of the country that experience over 100 centimeters annual precipitation; a comparison of maps 5 and 8 shows this clearly.[1] Within this area in many favourable sections with adequate supplies of water, two, and sometimes even three, crops of rice have been, and are still being produced. The cropping seasons vary from one part to the other; different local names are given to these seasons and the crops (*refer to table III*).

Methods of cultivation are still largely the traditional ones; mechanization can be introduced only very slowly and, that too, can be only limited in scope. Most of the cultivators are illiterate and learn very slowly; they know how to construct and repair the simple implements they use. Mechanization, in the initial stages, must be mainly in the form of improvement of the quality of the simple implements used by the cultivators; complicated new machinery would not be of much value, excepting in experimental farms. Productivity can be increased not so much by mechanization as by the use of improved fertilizers and clever rotation of crops.

Methods of sowing rice include transplanting, broadcasting, dibbling and drilling the seeds. Broadcasting is essentially throwing the seeds over the soil; dibbling is dropping the seeds at regular intervals in the furrows made by the country plough; in drilling the seeds are guided through a bamboo shaft attached to the plough so that they are laid in a straight line in the furrow made by the plough. Dibbling and drilling are better methods of sowing than broadcasting; seeds are economically used and the rice plants are more evenly spread out in the field; drilling is actually the best method of sowing. In areas where soil moisture is moderate soil is compacted after sowing by a flattening plank that is driven over the furrow; this is not necessary in areas of high precipitation like Kerala and West Bengal; in some areas the seeds

---

[1] This is also largely the area of dense population (refer to map).

Plate 5. PADDY CULTIVATION (*see page 25*)

Plate 6. WHEAT CULTIVATION IN CENTRAL INDIA

(*see page 27*)

Plate 7. MILLET

(*see page 31*)

Plate 8. MAIZE FARM IN NORTH INDIA

(*see page 31*)

are soaked for some hours before being sown in the field to enable easy germination in a soil that is not moist enough.

In transplantation, the seedlings are sown in a carefully prepared nursery. After about four weeks, the seedlings are uprooted and planted in the puddled fields, which have been prepared to receive them. Transplantation is helpful in achieving economical use of water and higher yields of grain. After transplantation, the water in the fields is gradually increased as the seedlings grow; about ten days before harvesting the water in the fields is drained off. The right stage for harvesting is when the ears are nearly ripe and the straw is just turning yellow; long experience in the field enables the Indian cultivator to choose the right time and get through the harvesting quite methodically. Harvesting is done by human labour; the crop is cut and allowed to dry in the fields for 3 to 4 days. After that it is threshed by the bullocks being made to trample over the sheaths of crop or by beating the heads of sheaths against a hard block.

Even though a very large amount of human labour is applied to rice cultivation, this cultivation cannot be considered intensive in the sense of high productivity per acre; the average yield per acre for the whole country is about 500 kilos (about 1,100 pounds). This compares poorly with average yields exceeding 1200 kilos in Japan. In experimental stations in different parts of the country yields of 1500 to 2000 kilos per acre have been reported; in these experimental farms cultivation (using more fertilizers, better seeds and better techniques) has been intensive in the European or Japanese sense; mere numbers of cultivators in the field working hard to produce crops cannot be described as intensive farming; when such human labour is applied scientifically, with the right techniques, for obtaining a high yield per acre then only can the activity be described as intensive farming. The high yields achieved in the experimental farms must be found in all the farms in the country if real self-sufficiency is to be achieved.

In recent years the annual production of rice has been fluctuating between 32 to 35 million tons with an area of 82 to 86 million acres. The area cannot be increased to any large extent;

but the yields can be, and should be; average annual imports of rice, in recent years, have been about half a million tons; this import can be completely avoided with a little more effort.

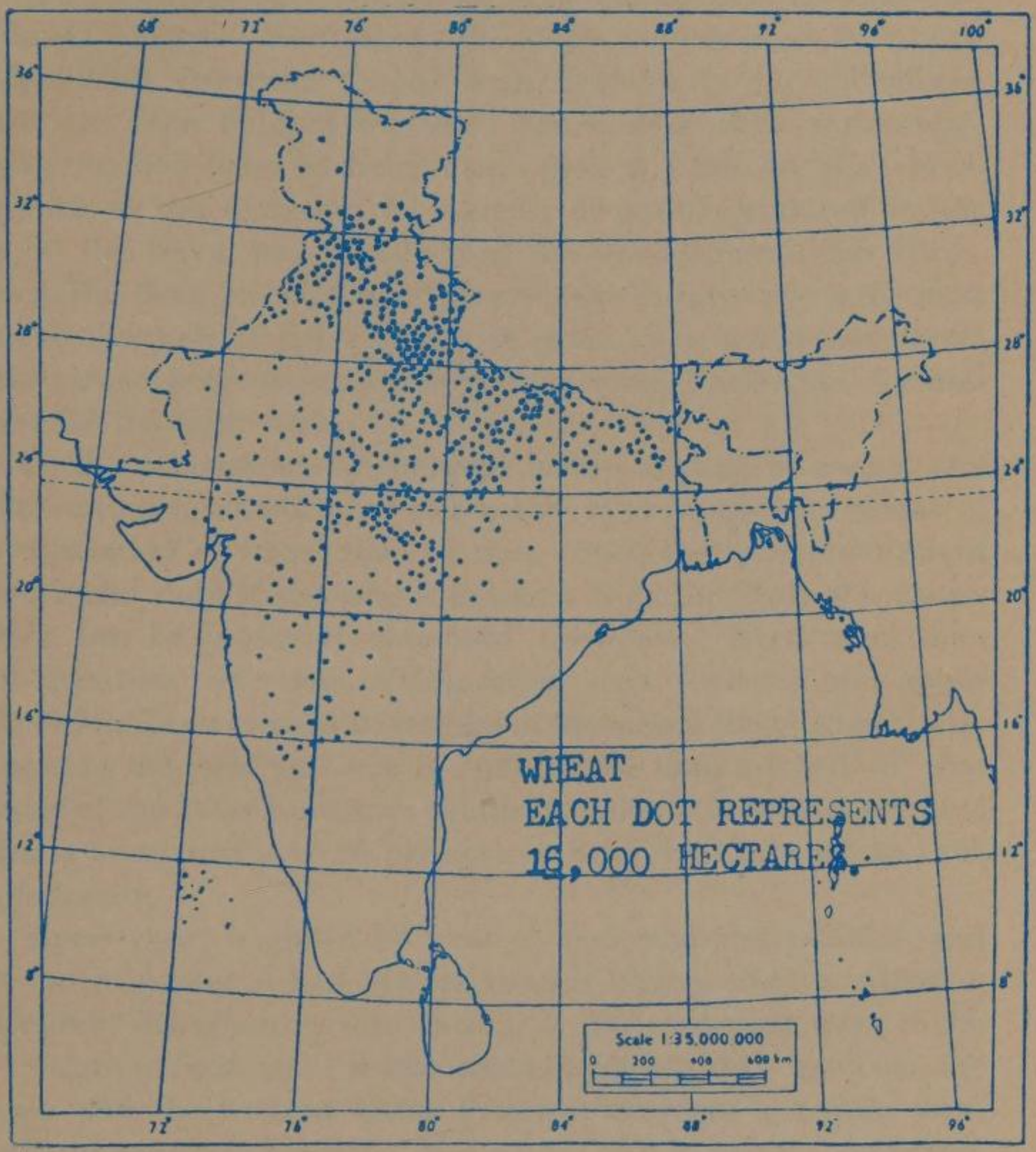
The paddy that is obtained after threshing has to be milled or pounded to get the rice. The rice grain contains vitamins and minerals in the surface layers; the core of the grain is essentially starch. Hand-pounded rice retains the nutrients in the grain to a greater extent than the machine-milled one. The highly polished rice from machine milling, for example, retains no protein at all whereas the hand-pounded rice retains as much as 15% of the proteins contained in the original grain. While milling helps in ensuring better keeping qualities for the grain and more attractive food when the grain has been cooked, it is desirable that the hand-pounded rice is consumed more widely because of its nutrient qualities. Reduction in the quantity of rice consumed by every individual in the mainly rice-consuming communities is desirable, and possible, if only some more nutritive substitutes or supplements (like vegetables, fruits or fish) are generally adopted; this effort is possible for the middle and the upper classes more easily than for the poorer ones; in the initial stages these groups could improve their health while helping the poorer communities to get adequate quantities of rice.

WHEAT

After rice wheat is an important cereal in India. Outside India, in some of the temperate countries of the world, it has been known, and used, for thousands of years. In India, however, its use has been comparatively recent.

Wheat thrives well in areas of moderate precipitations and moderate temperatures. About 75% of the world's wheat-lands have a precipitation ranging between 50 and 80 centimeters and temperatures between 8 and 28°C., temperatures in excess of 30-32°C. are harmful to the plant; similarly temperatures below 5°C. are not desirable. Silt and clay loams give the best yields; in general medium to heavy textured soils, fertile and well-drained, are good for this cereal.

Map 9 Wheat



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

In India suitable physical conditions are found in the west and north west (*Map 9*) during the winter months; wheat is, therefore, a rabi crop. About 10 to 12 million tons of wheat are produced annually from about 30 to 34 million acres of wheat-lands. With reference to the area devoted to its cultivation, wheat has been holding the third place (after Rice and Jowar) among the food crops in the country (*refer to Table No. II*). With reference to the quantity, by weight, of grains produced in the country this cereal has been holding the second place (after Rice). Among the three principal food crops of the country rice is the most valuable because of the quantity of grain obtained in every acre; next to rice wheat comes; jowar yields are much less than rice and wheat for the same area.

In the preparation of the land before sowing, in sowing and in harvesting mechanization is possible to a far greater extent in the cultivation of wheat than in rice. Such mechanization might prove useful only if the labour released from the fields as a consequence can be profitably employed elsewhere. Even more than mechanization, selection of improved seed varieties and application of fertilizers would be helpful in increasing the yield per acre. At present the yield per acre in India is less than a fourth of that in some of the West European countries (about 12 bushels per acre in India as against over 50 per acre in Belgium, Denmark and the Netherlands).

Since wheat is grown in areas of moderate precipitation, and that too in winter (when precipitation is largely due to extension of westerly disturbances into India), it has to depend very much on irrigation facilities. While these facilities are good in the Punjab and the western Uttar Pradesh; they are not quite satisfactory in Madhya Pradesh, Rajasthan and Gujarat. Improvement in the supply of irrigation waters would help increase in production.

Most of the wheat grown in India belongs to the variety known as common wheat (*Triticum vulgare*), which has a long spike in proportion to its thickness; the principal types grown have either soft or hard kernels, white or red in colour; many

varieties of each type are grown. Next to common wheat, Durum wheat (*Triticum durum*) is also grown widely in the country[1].

Sowing is taken up sometime in October, after the rains have stopped; this is done in rows about 25 centimeters apart. The seeds are fed into the field through one or more hollow shafts; the seeds are actually dropped into the shafts by hand. Since the sowing is done soon after the rainy season there is enough moisture in the soil to help the growth of the plant in its early stages. Harvesting is generally completed before the very hot summer comes on; it is usually over by the middle of May. This is still done, in most of the wheat-lands, with hand sickles.

The harvested crop has to be threshed and winnowed before the grains are separated from the rest of the plant. The grains are converted into flour by hand-grinders or machine-millers; the latter method is quite wide-spread; even small settlements have a flour-mill where the grains are converted into wheat flour. This wheat flour is used in the making of different types of *rotis* or country breads[2] and sweets of various shapes and sizes. Other products, like vermicelli, spaghetti, macoroni etc. are also being produced for consumers who want variety.

BARLEY

Barley is an important cereal that thrives well under conditions suitable for wheat also. It is more adaptable to variations in natural physical conditions than wheat; because of this quality it is grown in areas where wheat cultivation would be more risky. It is a rabi crop and takes five to five and a half months from the sowing to the harvesting times; sowing is done in October-November and harvesting in April-May. Inter-culture of barley with crops like peas, Bengal gram, wheat or mustard is widely practised.

This cereal is grown mainly in the middle and upper Ganga plains. Many varieties of this cereal have been developed for cultivation in the drier Rajasthan and the wetter Bihar areas.

---

[1] The Indian wheats are hard varieties and have a protein content of 14 to 16%.

[2] The more popular varieties are the *chapatis*, *parathas* and *naans*.

In recent years the area under barley has been about 8 million acres with an annual yield of about 3 million tons. The yields, however, are low compared to the yields in countries of Western Europe or even the Soviet Union (about 15 bushels per acre in India, 12 in Pakistan, 40 in Soviet Union, 52 in Western Germany, 65 in Denmark and 71 in the Netherlands). There is considerable scope for increasing the yield. The cereal is particularly useful for conversion into malt which, again, is used for brewing beer and other alcoholic products; malted milk concentrates and breakfast foods are also derived from this cereal. In India this cereal is used for all these purposes. It is not one of the major food crops and, consequently, is not as important in this country as rice, wheat and jowar.

The value of this cereal in the development of an industry producing beer and other alcoholic products for export cannot be over-looked; the market for these products within the country is limited; the industry should meet all the home-demands and export to other countries.

MILLETS

Among the millets cultivated in India the more important ones are jowar or cholam (*Sorghum*), bajra or camboo (*Pennisetum*) and ragi (*Eleusine*). These are grown not only for the grain they yield but also for their straw, a valuable cattle fodder. These millets are grown all over the country in areas of low to moderate rainfall; they are less sensitive to moisture and soil-deficiencies than rice, wheat and barley. They are short duration crops (*refer to table No. III*) mostly grown in the drier interior during the rainy season. The grains form a valuable supplement, or even substitute[1], to the major cereals like rice and wheat; the stem and the straw are given to the bullocks that still pull the ploughs or help raise water from the wells. It would be true to say that these millets actually sustain, to a considerable extent,

[1] For most of the poor people who actually cultivate the land these grains provide the main food; the grains are made into flour, and flour mixed with water and salt, is patted into *pattis* or *rotis* for consumption.

the human and animal labour in the fields, especially in the more harsh environments.

JOWAR

Jowar is the most important of the millets; an area of about 44 million acres is given to it; the annual yield has been fluctuating around 9 million tons. Since it thrives well even in areas of low rainfall, and can withstand drought to some extent, it is grown over a wide area where precipitation is limited. Many varieties have been evolved to suit different climatic and soil conditions; some varieties take only three months from the time of sowing to the time of harvesting; others take as much as five months. The crop is grown both in summer and winter; it is therefore, a kharif and a rabi crop. The yield per acre (of 200 kilos) is poor compared to U.S.A. (1200 kilos), which is one of the large producers of corn or maize.

This grain is ground each day in the homes of the poor people[1] and the flour so obtained is used in the making of flat *rotis* for consumption. The jowar *roti* may not be as tasty as wheat-flour *roti* to the sophisticated people; it is, nevertheless, satisfying to the poor people, who cannot afford wheat everyday. It contains 12-16 percent protein and 63-73 percent starch. The stalks are good cattle fodder; in the drier peninsular upland the stalks tend to be "juicy" (an adaptation for drought resistance) and, consequently, more relished by cattle.

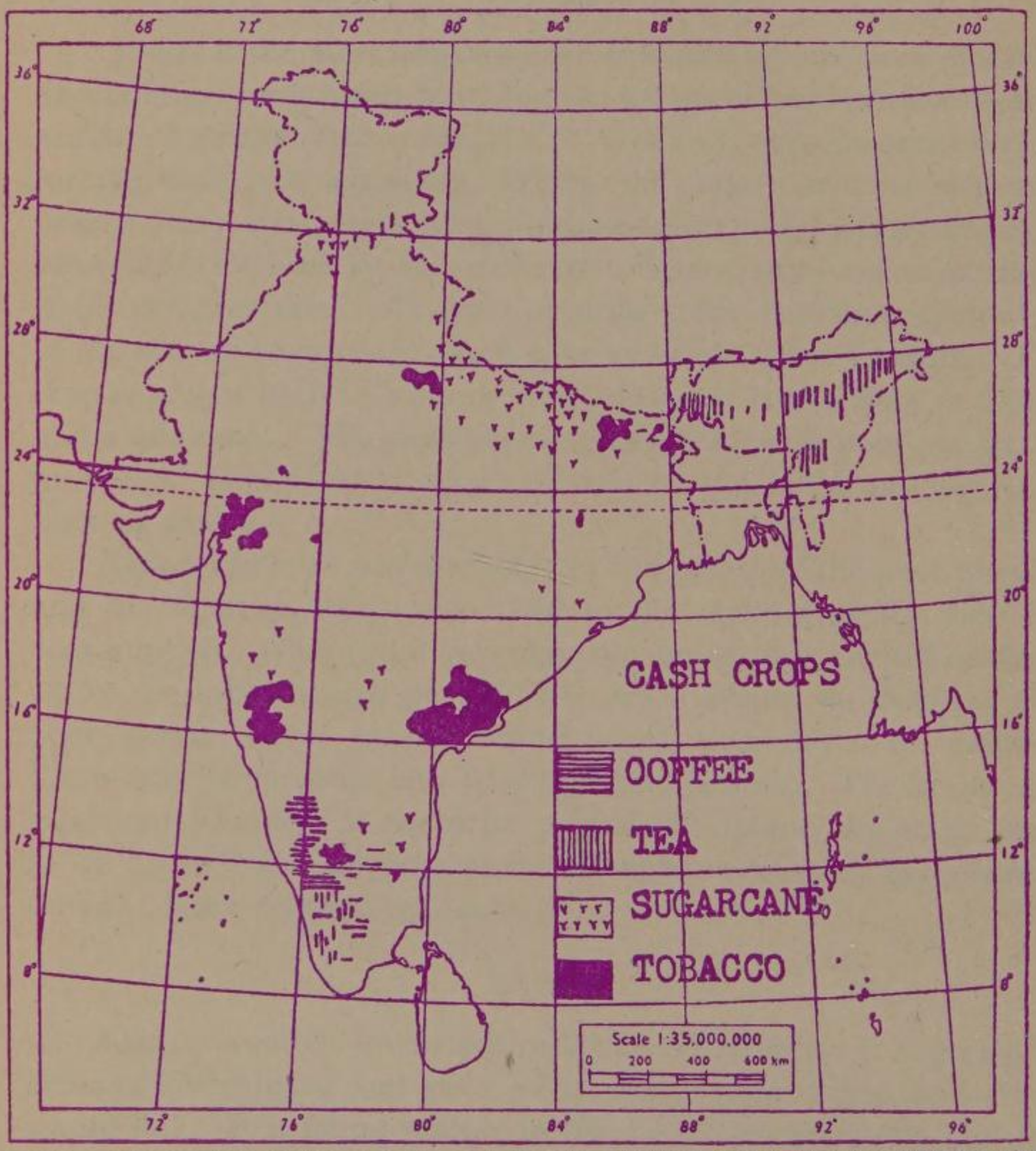
BAJRA

Bajra is another important millet in the country; it is grown in areas of low rainfall and poor soils, where most other food crops would fail. It is found mainly in the north-western India and the peninsular interiors. It is grown during the rainy season and is, therefore, a kharif crop. Sowing is done in June and harvesting in November-December. At the time of harvesting the heads

---

[1] Otherwise the flour would become rancid because of the presence of the embryo.

Map 10 Some Important Cash Crops



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

are cut by hand and the grain flailed out on a threshing board or floor.

Usually the grain is ground into flour which is cooked into a gruel or porridge; the flour is also used for baking into a coarse bread. After the removal of the heads the rest of the plant is given to the cattle as fodder or used as fuel. The annual production has been about 3½ to 4 million tons, with an area of 27-28 million acres given to the crop. The yields have been about 120 to 140 kilos per acre, which is a poor show. The crop is very important for the very poor peasants; for them it is the main food that keeps them alive.

RAGI

Ragi is the third important millet in the country; an area of 5-6 million acres is given over to the crop; the annual output is 1.8 to 2 million tons. This is one of the hardiest crops in the country, capable of standing severe droughts; so it is generally grown in areas of poor rainfall and, often, poor soils; it is grown either as a dry crop with dry farming techniques or as an irrigated crop. It is an important kharif crop in the southern half of the peninsular plateau in areas of low rainfall. From the time of sowing (May/August) to the time of harvesting (October/November) the crop requires 3½ to 4 months.

Ragi is very important in the agricultural economy of southern India for various reasons. It is a short duration crop and permits inter-culture with other kharif crops that do not require too much soil moisture. Both the plant and the grain remain free from pests and diseases. The plant is hardy and can stand droughts that would destroy most other crops. The grain has great nutritive value and is very suitable for the cultivator doing hard physical labour. The grain, if kept quite dry, can be stored for many years without being damaged. The straw is good for both the working and the milch animals. The grain flour is used for making gruel, porridge and *rotis*; the grain is hand-pounded either into a coarse flour or a fine flour; the former is good for making gruel or porridge while the latter is converted into *rotis*.

MAIZE

Maize (Zea) is grown over an area of 11-12 million acres yielding an annual output of 4-5 million tons. It is largely a kharif crop, sown in June-July and harvested in October-November. It is important in the northern states, especially in the sub-montane belt of Uttar Pradesh and Bihar. It is the staple food for a large number of people in this area especially in the winter months. It is also used as fodder for animals. India's annual production of maize is about 2% of the world production; the United States produces about 60%.

PULSES

The important group of crops known as Pulses occupy an area of about 58 million acres; the annual production is about 12 million tons. These are grown all over the country. The important pulse crops are:

Bengal Gram (*Chana*)
Red Gram (*Arhar* or *Tur*)
Black Gram (*Mash* or *Kalai*)
Green Gram (*Moong*)
Lentil (*Masur*)
Horse Gram (*Kulthi*)
Lakk (*Khessari*)
Moth (*Matki*)

The value of these pulses lies in the fact that the farmer can practise crop rotations and crop mixtures with them. Being leguminous plants they help in restoring soil fertility. Being rich in proteins they are essential to the large vegetarian population consuming staple food solely of starchy cereals. Some of the pulses serve as excellent forage and grain concentrates in the feed of the large numbers of cattle in the country.

Plate 9. COCONUT PLANTATION (*see page 33*)

Plate 10. PEPPER PLANT

(*see page 36*)

CHAPTER IV

LAND-USE : OIL-SEEDS AND SPICES

In addition to the food crops considered in the previous chapter there are a large number of crops which yield cooking oils or flavourings that give greater taste to the food consumed by the people. The important ones are :

Coconut	Pepper
Groundnut	Chillies
Castor	Cardamom
Sesamum	Ginger
Rape	Turmeric
Mustard	Cinnamon
	Cloves
	Nutmeg

COCONUT

This (*cocos nucifera*) thrives well in sandy soils, especially in littoral locations. The tree starts yielding nuts 6-8 years after planting; some of the dwarf varieties yield nuts within 4 years after planting.

The important and dominant variety is that which is widely grown in Kerala state. This is a tall tree, that starts yielding 6-8 years after planting; about 60-70 nuts per tree per year is the normal yield. In the early stages the nut has plenty of sweet water. The weight of the Copra, per nut, is about 7-8 oz. and the oil content 65-66 %.

In India about two million acres are devoted to coconut and the annual yield is about 4500 million nuts. Most of the plantations are within ten miles of the coast, or close to the rivers, in the Kerala, Madras and Mysore States which are the main producers of coconut.

This tropical palm is completely used by the people. Every part of it is used up. The nut yields copra-oil, oil-cake, and fibre for coir; the plaited leaves are used for making screens and roofing; the unopened spadices are tapped to extract juice or toddy; the trunk of the mature tree is used as timber for constructional purposes. It would be difficult to think of any other tree in the world which is so important to each and every individual in a state as coconut is to the people of the Kerala State.

GROUNDNUT

Groundnut is grown widely all over the peninsular India. Though it can be grown in sub-tropical latitudes it thrives best in tropical areas. It is grown both as a dry and irrigated crop. Yields are good when the rain fed crop gets 75-100 centimeters of rainfall. The plant takes 4-5 months to yield the valuable nut, which is generally converted into oil. Since it is a short crop it can be grown along with taller crops like jowar, bajra, castor and cotton. Sowing is done in June-July and harvesting takes place between October and December.

The four southern states (Kerala, Madras, Mysore and Andhra Pradesh) and the two western states (Maharashtra and Gujarat) account for more than 90% of the acreage and production in the country. About 16 million acres are devoted to groundnut; the annual yield is around 4.5 million tons (nuts in shell).

Apart from the valuable oil that it yields, the nut is also used for direct consumption, raw or roasted. The plant has good soil recuperative value and forms a good cover against soil erosion; it is also a good forage crop for cattle.

CASTOR

Castor is another important plant that yields a very valuable oil-seed. The oil has many uses—domestic, medicinal and industrial. The oil-cake is a valuable fertilizer. India is the leading producer of castor-oil in the world. About one million acres are given to the crop and the annual yield is about 0.1 million tons of castor seed.

Castor is both a kharif and a rabi crop; it requires 5 to 8 months from sowing to harvesting. Consequently it is the main, and often the only, crop for the year wherever it is cultivated; many other crops can, however, be grown along with it. It is grown in the comparatively dry areas of the peninsula, mainly in interior Andhra Pradesh; the adjoining parts of Orissa, Maharashtra and Mysore also cultivate this crop. Andhra Pradesh, however, is the leading producer accounting for about two-thirds of the area in the country given to this crop.

SESAMUM

Sesamum is grown all over India; nearly every state (excepting Assam, Jammu and Kashmir) grows some sesamum. It takes 3-4 months to grow; it is often rotated with some other crop like ragi, jowar or black-gram. It is cultivated as a kharif or rabi crop. About six million acres are given to this crop; the annual yield is about half a million tons.

The oil derived from the seed is widely used as a cooking medium; this is particularly in the three southern states of Madras, Mysore and Andhra Pradesh.[1] The oil-cake, after the oil has been squeezed out, is a good feed for cattle. Occasionally it is also consumed by the poorer people, who add sugar to it to sweeten it before eating it.

RAPE AND MUSTARD

Rape and mustard are similar oil-seeds (of the crucifer family) grown in northern India and consumed largely in that area. Uttar Pradesh, Punjab, Bihar and Assam are the major cultivators; they use this oil for cooking and for the preparation of toilet articles. The oil-cake is used as cattle feed or manure. Rape oil, like castor oil, is also exported and finds use, after refinement, as a lubricant. Mustard oil is to Bengal and Assam what coconut oil is to Kerala. An area of about $7\frac{1}{2}$ million acres is given to rape and mustard plants; the annual yield is 1.2 milion tons. These are rabi crops and take 4-5 months from sowing to harvesting season.

[1] Kerala State uses coconut oil as a cooking medium.

LINSEED

Linseed is grown in the northern states mainly for the oil which is used extensively in the making of paints and varnishes. The oil has the property of drying up quickly. The flax from the plant is very useful for making linen; most of the Indian linseed plants yield poor quality flax and therefore the importance of the crop is for its oil rather than the flax. Only Bihar and Bengal have some good flax-yielding varieties which are valuable, as a consequence, for both the flax and the oil-seeds. About half a million tons of linseed are produced annually over an area of 4½ million acres. Yields vary from state to state; Punjab and Uttar Pradesh get high yields whereas Maharashtra and Bihar get much lower ones.

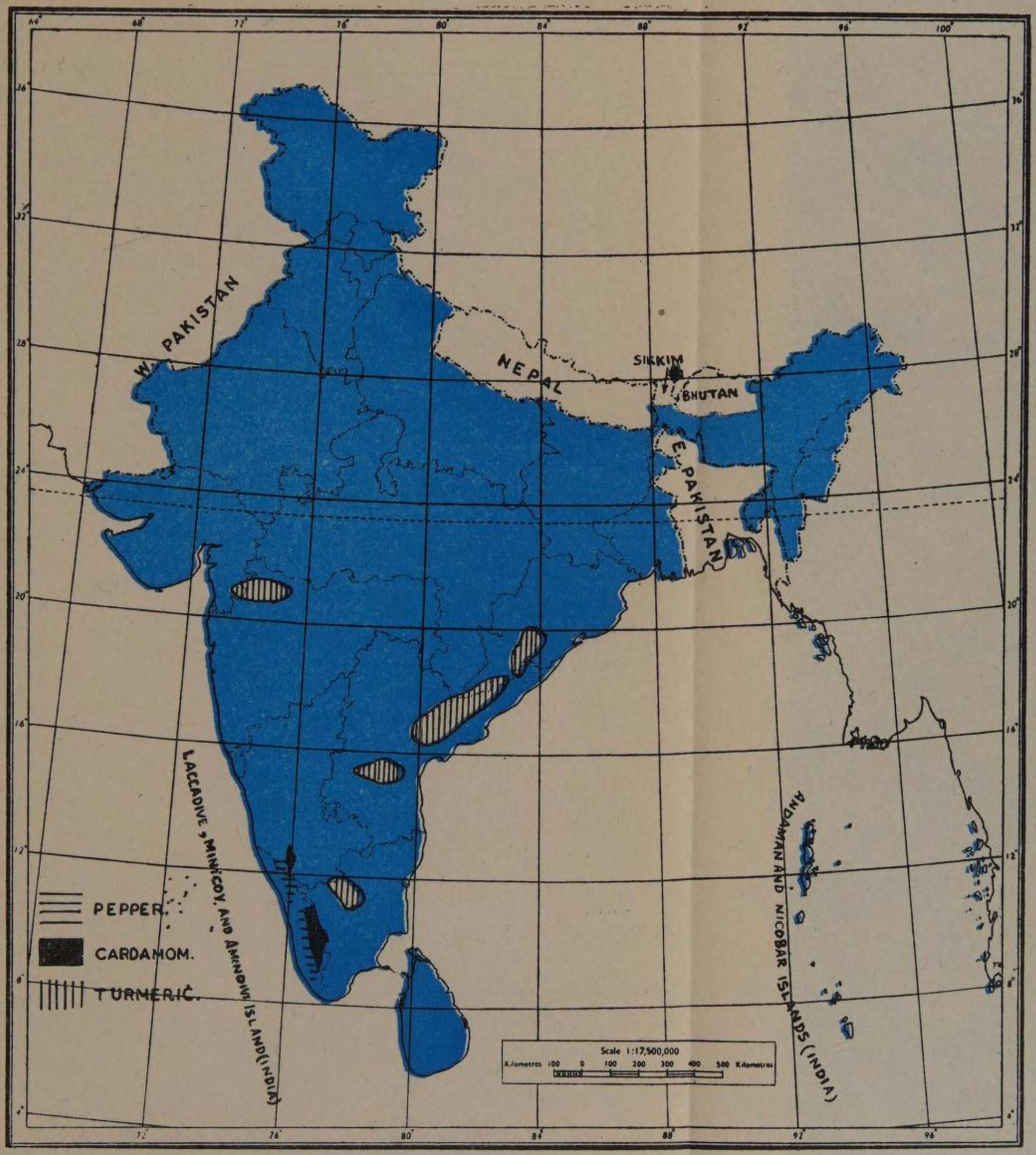
PEPPER

Pepper (*Piper nigrum*, L) is an important crop in the group that is commonly described as "Spices". It thrives well only in hot humid atmosphere—not less than 12°C to not more than 40°C in any part of the year. In India, about a quarter of a million acres are devoted to this crop, yielding about 30,000 tons of pepper. Most of the crop comes from the state of Kerala, where it is grown away from the coastal plains, mainly in the lower slopes of the Anaimalai and other associated ranges. The adjoining hilly areas of Madras and Mysore states also account for some of the pepper produced in the country. (*Map 11*).

The pepper plant is a vine and needs some support on which it could climb. If allowed it could climb to heights of 10-12 meters; it is generally kept down to a height of 3 to 5 meters by controlling the height of its support. In India most of the supports are living trees—trees in the jungle or specially planted Murukku (*Erythrina indica*) trees. After three years the vine starts yielding the berries; from the seventh year full yield starts and for the following 18 to 20 years the yield is generally good; in plantations 25-30 years is the life of a plant.

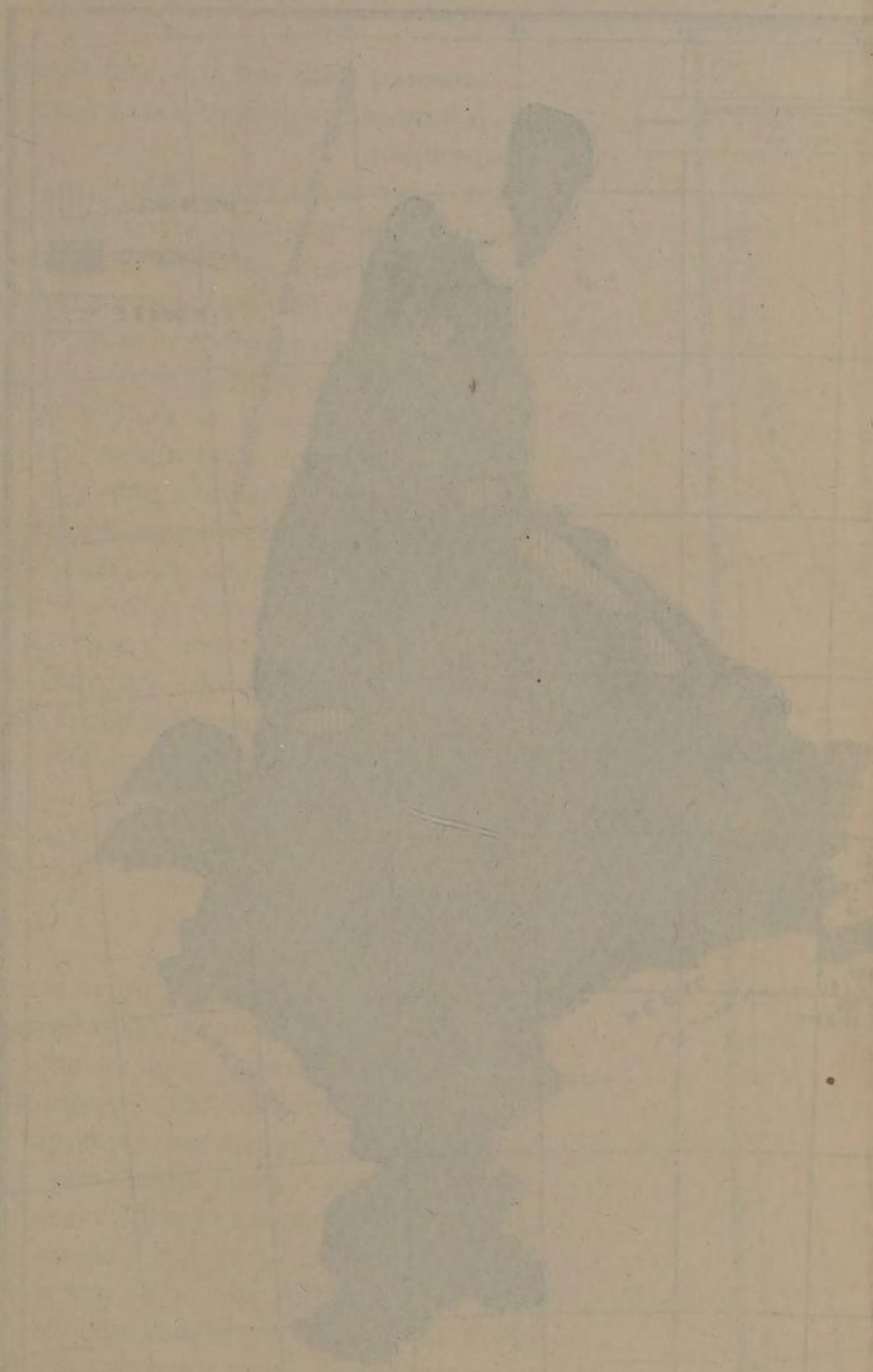
The harvesting season is January to March every year. The spikes with the berries are removed from the vine and spread out

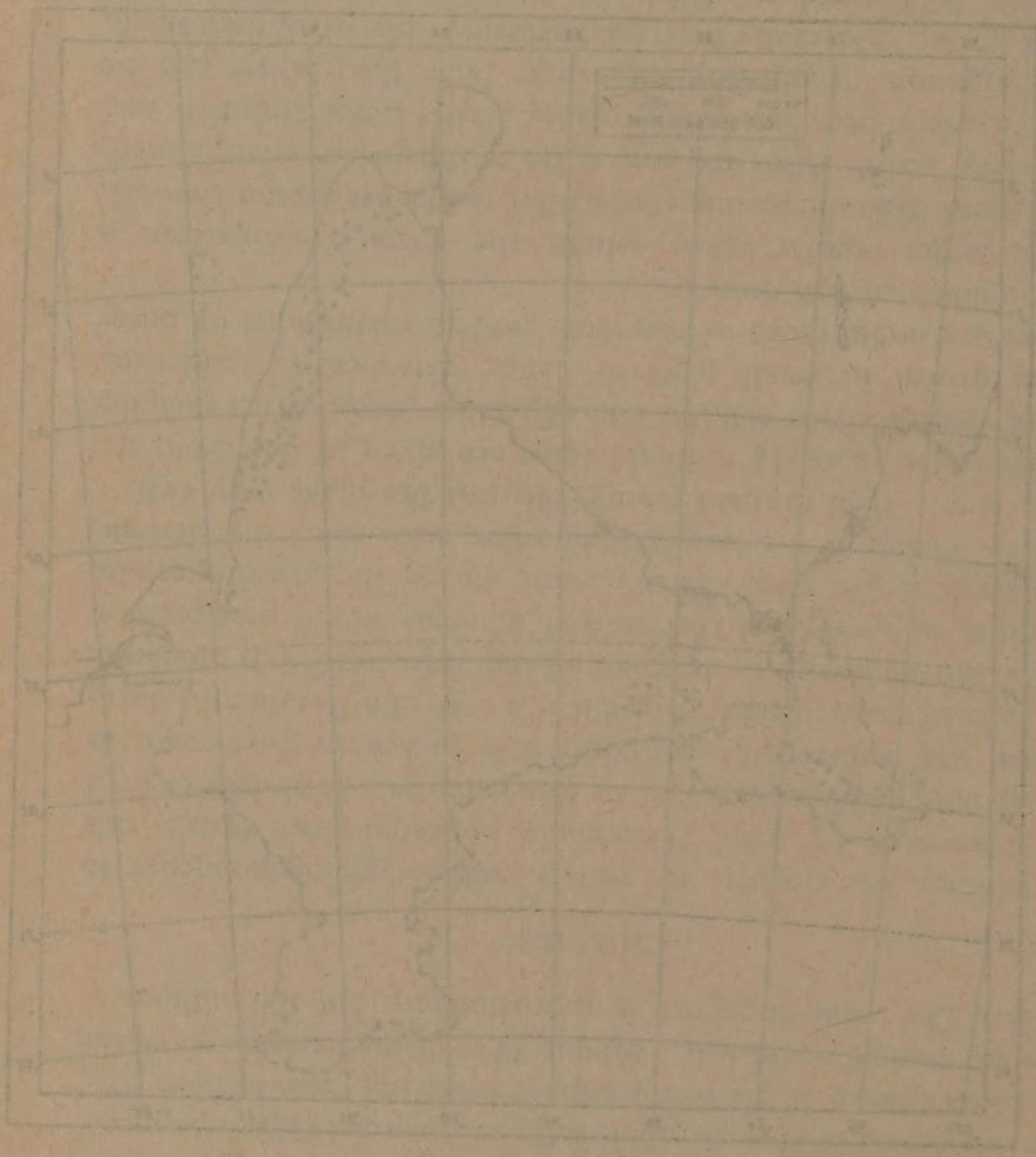
Map 11 **Pepper, Cardamom and Turmeric**



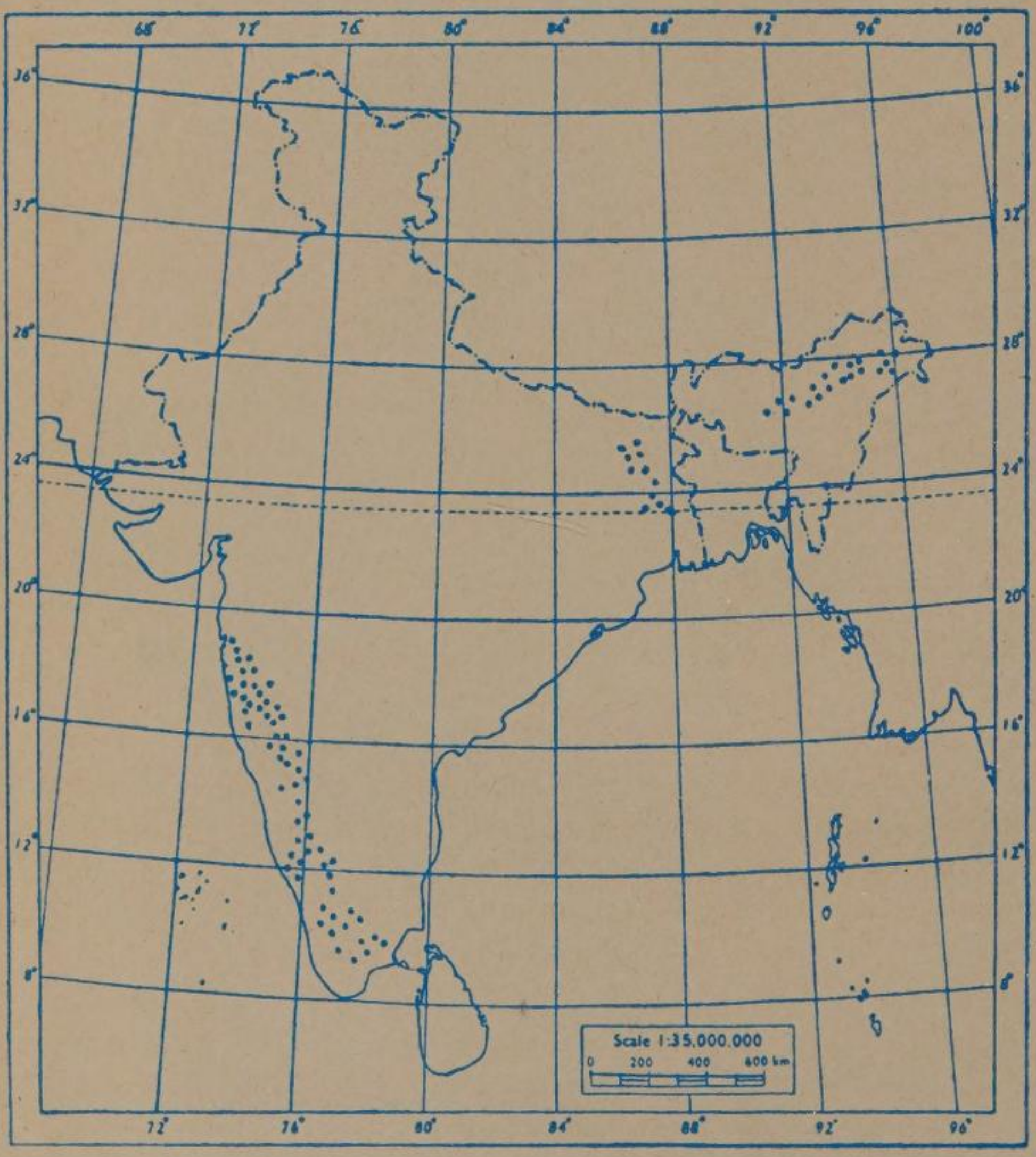
BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.





Map 12 **Arecanut**



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

on a clean floor or mats; trampling over them or rubbing them between the palms of the hand helps in detaching the berries from the slender spikes. The berries are dried for 5-6 days by exposure to the sun; they shrink and have a black wrinkled appearance after this period of drying. This is the commercial "black pepper."

India's share of the world pepper trade has risen to over 70% since the second world war. About 70% of the exports go to the U.S.A. The value of exports is approximately Rs. 100 millions.

CHILLIES

Chillies, like pepper, are widely used for giving pungency to food consumed by man. Originally imported from Brazil, this crop is now widely cultivated in this country. It thrives well in tropical and subtropical latitudes; it is grown in back-yards as well as in extensive fields. Since it is a crop of a few months duration, it can be grown in any part of the year. It needs moderate quantities of water and thrives well in areas where precipitation is 60 cms. to 120 cms. Heavy rains during the growing season leads to rotting of the leaves; light rains, with short dry periods, suit it best. Well drained loamy soils suit the plant very well.

In India about $1\frac{1}{2}$ million acres are given to this crop; the annual yield is about 400,000 tons of chillies (dry). This excludes chillies grown in small plots of lands attached to residences. Chillies are useful crops in vegetable gardens maintained by many house-holders in the country.

In larger regular fields, where the crop is grown on a commercial basis the sowing starts, after the first monsoon showers, in nursery beds. After six weeks the seedlings are transplanted; in the nursery beds the young plants need careful attention and light irrigation. Eight to nine weeks later the chillies can be picked green. Generally they are harvested only when they ripen, sometime in November. With careful irrigation a plant can be made to yield right upto January or February. The commercial crop is the dried chillies, red and wrinkled, after two weeks of exposure to the sun. Yield per acre varies from 100 to 600 kilos per acre; good yields exceeding 500 kilos per acre come from

carefully irrigated plots where soil and drainage are good. More than 80% of the production comes from the six states of Peninsular India.

CARDAMOM

Cardamom (*Elettaria cardamomum*) plant is a perennial that thrives in warm humid climates. The fruits of the plant are small capsules, pale green, or cream in colour, containing 15 to 20 chocolate-coloured seeds; these seeds are hard and have an attractive aroma. These fruits, suitably dried, are the commercially important part of the plant.

The cardamom plant needs shade and is, therefore, grown in the shade of larger trees. It thrives well in well-drained soils rich in humus. A well distributed annual precipitation of over 150 cms. and a temperature ranging between 12° C to 32° C suits the plant very well. Consequently this crop is confined to the moist evergreen forest lands of the southern states of Kerala and Mysore; here the crop is found in the higher slopes ranging between 800 and 1600 meters. One area where this crop is concentrated, in Kerala is known as the Cardamom Hills. (*Map 11.*)

Three years after planting the yield of fruits begins. Harvesting commences in August and lasts upto March. The capsules do not mature simultaneously; so the fruits are gathered as and when they are ready during the period of harvesting; each plant, and each plantation, is checked after four-week intervals for capsules that are ready for plucking. After a period of 12 to 16 years, the cropped area is generally abandoned to the jungle and new plots are chosen for a new set of plants.

About 0.12 million acres are generally given to this crop; the annual yield is approximately 1500 tons. A little over half the area and production belongs to Kerala state; Mysore and Madras states account for the rest of the acreage and production. The cardamom seeds are used in India for culinary purposes and are also chewed with betel leaves and areca nuts. Export is mainly to the Scandinavian countries and Germany, where the powdered seeds are used for flavouring cakes and pastries.

GINGER

Ginger thrives well in humid tropical areas where the soil is well-drained. In the state of Kerala the crop is grown on some of the lower slopes. Even though it is a perennial, the crop is treated as an annual; small portions of the stems of the previous crop are planted in carefully prepared plots, late in May or early in June. The plant grows to a height of about 50-60 cms and develops underground stems in 6-7 months. Commercial ginger is the dried underground stem; actually most of the ginger is consumed locally in green form. Dried ginger of commerce forms only a small part of the total production.

The area and production of the crop for commercial purposes is about 40,000 acres and 17,000 tons respectively; over sixty percent belongs to Kerala state. Commercial ginger is used in the preparation of drinks and for culinary purposes. India is the most important producer of this commercial ginger.

TURMERIC

Turmeric (*Curcuma longa*) is a tropical crop that thrives well with sandy loams; there should be no water-logging. In the states of Andhra Pradesh and Orissa, which are the main producers, it is cultivated with irrigation and heavy application of cattle manure. The part of the plant used in commerce is the dried underground stem; the drying is done after boiling in earthen pots. This is used as an important condiment in most Indian homes. Generally it is powdered and kept ready for use. It is valuable as an anti-septic agent and is often used as such by direct application on wounds. Because of its protective qualities it has also been used for application on the body while bathing.

About 0.15 million acres are given to this crop; the annual output of dry cured turmeric is about 0.14 million tons. About 90 % of the production is used within India itself. The small export is to Ceylon, Iran, U.S.A. and U.K.

Cinnamon, *clove* and *nutmeg* are other "Spice" crops cultivated in India; they are mostly in the peninsular south where warm humid conditions prevail. Each of these has only a small area

given to it.

The crops that have been considered so far (cereals, millets, oil-seeds and spices) are all connected, to a considerable extent, with the food consumed by the people of India. Two other crops should be associated with these—betel and tobacco. These are widely used in the country, generally taken after food has been consumed.

BETEL

Betel plant (*Piper betle*) is a creeper cultivated for the valuable leaves it yields. The leaves are chewed along with areca nut, lime and many other flavouring ingredients (like cardamom, clove, tobacco etc.). Chewing betel leaves, with all these associates, is believed to help digestion; this might be true to some extent because such chewing helps increased output of saliva that is swallowed. Irrespective of these supposed values such chewing has become a habit with millions of people (comparable to chewing-gums used in other countries). Many varieties of this creeper are grown in India and go by special local names.[1]

The creeper needs supports on which it climbs; some tree standards are used for this purpose; the creeper has to be carefully trained on the supports; manuring, weeding and watering have to be done regularly. Deep heavy clays are good for the vine; the soil must be carefully drained. Where precipitation is less than 100 cms. irrigation is essential. The vine must be protected from exposure to the Sun and strong winds. Each plot is protected on all sides by screens and given shade by the leaves of the supporting trees; the plots are generally small, less than quarter of an acre, since the vines have to be given very great attention all the time. The vines can yield leaves, year after year, for many years. Yields vary in different parts of India; they range from 0.5 to 5 million leaves per acre. Nearly all the states produce betel leaves and practically all of it is consumed within the country.

---

[1] Kumbala balli, Kari balli, Naga balli, Ambadi in Mysore state; Kumbakonam, Poonamallee in Madras; Kali and Velchi in Maharashtra; Mahoba and Banarasi in North India.

Plate 11. BETEL VINE (*see page 40*)

Plate 12. TOBACCO PLANTATION IN ANDHRA PRADESH

(*see page 41*)

Plate 13. TEA PLANTATION IN NORTH-EAST INDIA

(*see page 42*)

Plate 14. COFFEE PLANT

(*see page 43*)

TOBACCO

Tobacco cultivation in India seems to have started only in the 17th century. Its use, now, is wide and appears unshakeable. A little over one million acres are given to this crop; the annual yield is about 0.35 million tons. Approximately 70% of the output achieved is from the States of Andhra Pradesh, Gujarat, Madras and Mysore. The yield per acre is moderate, about 320 kilos per acre. The plant thrives well in areas of moderate precipitation, 50 cms. to 100 cms., with temperatures ranging from 15°C to 40°C. Bright rainless weather is needed at the later stages of the 3-4 months period of the crop growth. Sowing starts in July and is over by October; harvesting begins in February and is over by the end of May. The crop is grown with or without, irrigation. When irrigated it is generally followed by another crop during the same year—ragi in the Madras State, maize or potato in the Punjab.

India grows the two widely consumed varieties of tobacco—Nicotiana tabacum and Nicotiana rustica; the latter thrives better in slightly cooler climates and is confined to the North; the tabacum variety is mainly in the South and West. The rustica variety is used mainly for chewing and for the preparation of snuff and hookah tobacco. The tabacum variety is produced in larger quantities and is used for making bidis, cigarettes and cigars. The variety very popular for cigarettes is grown mostly in Andhra Pradesh; a variety good for making cigars is grown in the Madras State.

CHAPTER V

LAND-USE : OTHER CROPS

SIX OTHER CROPS have an important place in the economy of the country . They have been the additional money-earners both at home and abroad. These are (1) Tea, (2) Coffee, (3) Sugar-cane, (4) Cotton, (5) Jute, (6) Rubber.

TEA

Tea belongs to the genus Camellia. The variety widely grown in this country is a shrub that normally grows to a height of 2 to 3 metres. The valuable part of the plant is the tender leaf and the bud; usually a bud and two leaves are picked; this is called a normal "pluck". If more than two leaves are taken the product is coarse tea; less than the normal "pluck" gives very fine tea.

The plant needs light shade and plenty of moisture. Rows of shade giving trees alternate with rows of shrub. The moisture required comes from the monsoon showers. Generally the tea plantations are in areas of well distributed rainfall exceeding 150 cms. annually (the N.E. and the S.W.). The plant needs well drained soils rich in Nitrogen; these conditions are met by developing the plantations on the slopes of hills and applying nitrogenous fertilisers periodically to the soil.

The bush has to be kept regularly pruned. In the northern plantations the bushes give 5 to 6 flushes in a season, the average interval between pluckings being a week. In South India plucking goes on all the year round. A good bush yields annually about 2 lbs. of green shoots; in a properly maintained plantation the annual yield of finished tea would range between 2,200 and 2,500 lbs. per acre. A bush normally yields for about 40 years; after that the yields tend to fall off.

The plucked bud and leaves have to be processed before the commercially important product is ready for packing. Withering,

rolling, fermenting, drying and grading are the important steps to be taken. The bulk of the Indian tea is processed into the black variety. India is the largest producer and exporter of tea in the world. Roughly 70% of the world production is from this country. Assam and West Bengal in the N.E. and Madras and Kerala in the South are the main producers.

COFFEE

About 0.3 million acres are given to coffee; The annual production is around 95 million lbs. The three Southern states of Mysore, Madras and Kerala produce all the Indian coffee. The coffee plant thrives in a hot, humid climate and needs well drained soils. Temparatures should range between 10°C and 28°C. Slopes are suitable for plantations because the soils can be kept free from water-logging. Normally the plant requires 150 cms. to 200 cms. of annual precipitation; it can flourish in areas of higher precipitation if the latter has a proper distribution during its growing season. Along the Mysore-Madras border, in the slopes of the many spurs associated with the western face of the peninsular plateau, plantations have been developed; these vary in size from one acre patches to 1,000 acre plantations. Since the plant is sensitive to direct exposure to sun and strong winds, it has to be protected by taller trees grown in the plantations.

As a rule coffee is grown from selected seeds; seedlings are raised in specially prepared seed-beds and transplanted into nurseries from where they are transferred to the fields. Seedlings are raised near the source of water; sometimes baskets of split bamboo are used for raising seedlings. It takes two years from the time of sowing the seeds to the final planting in the plantations. The plants start yielding fruit when 3 years old and maintain a good yield for 30 to 50 years. Only ripe berries are picked. Processing involves the removal of the skin, parchment and pulp of the fruit. The beans are sun dried for about two weeks. The beverage is prepared by using the powdered roasted beans for a decoction.

Most of the coffee grown in India belongs to the Arabica or

the Robusta varieties. About one-third of the total production is exported. The remaining two-thirds are mostly consumed in the 3 states of Madras, Mysore and Andhra Pradesh. The value of the exports is 95 to 100 million rupees annually.

SUGAR-CANE

Sugar-cane is essentially a tropical plant. It is a long duration crop which is kept in the fields for 10 to 12 months. In some areas the harvesting is done a year and a half after planting. The natural conditions suitable for sugar cane include well drained medium loam soils, or rich clay loams, with adequate facilities for drainage. The plant is a soil exhausting one; farm-yard manure and nitrogenous fertilisers have to be added to the soil periodically. Climatically, the plant thrives well in areas of 75 to 100 cms. annual rainfall. Temperatures ranging between 10°C and 30°C are helpful.

The crop is propagated vegetatively. The top parts of the cane form good planting material. Generally planting is done during the January-April period. The time of harvesting depends on the age of the crop, the area and the quality of the cane. Usually harvesting is possible ten to fourteen months after planting. The average yield of cane is 12,000 kilos per acre in the northern plantations while in the South it is nearly double that. Very high yields, however, have been obtained with improved varieties (like the Coimbatore 419); such yields have been more than 100 tons per acre. Improved hybrid varieties are grown in more than 90% of the area under this crop. Most of these have come from the Research Institute at Coimbatore.

Uttar Pradesh, Bihar and the Punjab have the largest area under sugar cane in the country; they produce about 80% of the total production. For the country as a whole, roughly 5.5 million acres are given to sugar cane; the annual production is about 90 million tons of cane. The value of annual exports vary between 150 to 170 million rupees.

COTTON

Cotton has been known to the people of India for over 3,000 years. It belongs to tropical and sub-tropical latitudes. The larger cotton growing areas are to be found between 40° N and 40° S latitudcs. India, the United States, Egypt and China are the major producers of cotton. This crop is generally cultivated in open country with a nearly flat topography. The crop thrives well between 20° C and 35° C; rainfall should be moderate, ranging between 50 cms. and 80 cms. annually. It can be cultivated with irrigation in areas of less precipitation. It is grown both as a dry and as an irrigated crop. In some areas two crops are obtained in one year. Mixed cropping is practised with cotton in many parts of the country. Millets, pulses, grams and some oil-seeds are brought into the mixed cropping practices. Sowing is done between April and August and harvesting between October and March.

Approximately 90 million acres are given to cotton; the annual output is about 4.8 million bales (392 lbs. per bale) of lint. Of the total production 16% to 17% is of the short staple variety, 43% to 44%, medium staple variety, 40% to 41% long staple variety. For purposes of trade 14 groups of cotton varieties according to the staple length and region of cultivation are known in this country. The following are the well known varieties[1] :

Trade varieties	*Tracts of growth*
Bengals	Punjab, Uttar Pradesh and Rajasthan.
Punjab Americans	Punjab, Uttar Pradesh and Rajasthan.
Comras	Madhya Pradesh, Khandesh, Vidarbha & Aurangabad, Divisions of Maharastra.
Gaorani	Aurangabad, Division of Maharashtra.
Central India	Areas of the erstwhile Madhya Bharat State.
Broach	Broach, Baroda, Kaira, Panchmahals and Sabarkantha districts of Gujarat.
Surti	Surat and Broach districts of Gujarat.

[1]After Randhawa, M.S., *Agriculture and Animal Husbandry in India* Page 172.

Dholleras	North Gujarat and Saurashtra.
Southerns	Mysore and Andhra Pradesh.
Tinnevellis	Coimbatore, Madurai, Ramanathapuram and Tirunelveli districts of Madras.
Cambodies	Coimbatore, Salem, Tiruchirapalli, Madurai, Ramanathapuram, and Tirunelveli districts of Madras.
Madras Uganda	Madurai, Ramanathapuram, Salem, Coimbatore, Tirunelveli, Chingleput and South Arcot districts of Madras.
Salems	Coimbatore and Tiruchirapalli districts of Madras.
Comillas	Hill tracts of Assam and Tripura.

The Maharashtra, Gujarat, Mysore, Madhya Pradesh, the Punjab and Andhra Pradesh, have, each, more than 750,000 acres under cotton. Maharashtra has the largest area, over 6 million acres. In actual production the order of the states is as follows: Gujarat, the Punjab, Maharashtra, Madras, Madhya Pradesh, Rajasthan, Mysore and Andhra Pradesh; each of these states produces over 100,000 bales. The highest yields are derived in the states of the Punjab, Madras, and Gujarat.

The value of exports of raw cotton and waste fluctuates around 200 million rupees. Cotton fabrics exported have a value of approximately 500 million rupees.

JUTE

Jute fibre, after processing, is woven into jute fabric, which is one of the widely used packing materials in the world. During the two world wars sand-filled jute bags were very much in use at the "fronts" as well as in the "rear" areas protecting the soldiers at war and the civilians at home. The two world wars actually boosted up the demand for jute products; during times of peace jute bags have been used largely as packing material, for transporting grains and all other types of commodities that enter international trade. Since the introduction of bulk-handling of grains

the demand for gunny bags has decreased much. This has led to alternative uses for jute, including making of fine fabrics for apparel, tapestry etc.

Jute is a very special crop belonging to a very small area in the world. Over 90% of the world's jute comes from an area which is 1/1000 of the world land-surface. This area belongs to the Indian Sub-continent, where it occupies the north eastern quarter. The area under jute is partly in East Pakistan and partly in Indian territory. This is the area where rainfall is high, 150 to 300 cms. annual average; in the non-rainy season there is plenty of water from the lower courses of the Ganga, Brahmaputra and Meghna. Plenty of water is required for growing the crop and also for processing it, after harvesting. The concentration of jute in this small area is not only because of this availabiliy of water but also because of the high atmospheric humidity, comparatively flat topography, alluvial soils, and abundance of cheap labour.

The area under jute, in India, has been a little over 2 million acres with an annual production of approximately 6 million bales (400 lbs. each) of dry fibre.

The area, and production, have always been fluctuating largely because of the nature of international market for jute products and the unfriendly relations between India and Pakistan. India has 60 % of the jute mills in the world and they depended on the considerable jute production in East Bengal (part of Pakistan now) before the partition, in 1947. Since partition Pakistan jute has not enough local mills to utilise it, while India's mills have not had enough local jute to feed them. India has been gradually increasing the area under jute (1.3 million acres in 1950 to 2.3 million acres in 1962) and, today, is still seriously bothered by lack of raw jute. The production has been varying from 3.2 million tonnes to 6.3 million tonnes during the same period.

Jute belongs to the family Chorchorus and is a slender stemmed annual; it grows to a height of 2-4 metres; the fibre in the inner bark is soft and strong, and can be drawn out in good lengths; this fibre is the commercially important part of the plant. The crude cloth woven out of it used to be the cheapest coarse

fabric known to the commercial world. Being highly adaptable, and facing competition from many other types of fabrics, it is now used in the making of many sophisticated products like carpets, rugs, linoleum and twines. India's exports are largely in the form of finished jute products; the value of exports fluctuates around 1.3 billion (1,300 million) rupees. This is a very important earner of foreign exchange for the country.

RUBBER

Many plants when injured, exude a sticky substance where they have been bruised; of these types of plants the Para-rubber tree (Hevea Brasiliensis) is the most significant; it exudes the widely used substance known as natural rubber. The tree thrives well in warm moist "equatorial type" climate; variations in temperature and humidity should be low; temperatures around 30° C and rainfall about 250 cms. a year suit the tree very well. In India the plantations are in the Southern part of the peninsula (Kerala, Mysore and Madras states), usually in the lower slopes of the hills (20 to 150 metres above sea-level) on lateritic loams or clayey loams.

Seven or eight years after planting the trees attain a girth of 50 cms.; tapping can be started at this stage; cuts are made on the bark about half a metre above the ground. The cuts are slanting ones extending to half the circumference of the trunk of the tree; cups are fixed at the lower end of the spiral cuts; collection from the cups is made daily or on alternate days. During the 4-6 weeks period of leaf fall, January-February, tapping is suspended as yields tend to be very low during this period. Tapping is resumed after refoliation is completed. During periods of heavy monsoon rainfall tapping is suspended; this may be as long as 4-6 weeks. Consequently, the number of tapping days in a year varies from 200 to 300, depending on location of plantations.

After collection, the fresh latex is allowed to coagulate, by the addition of measured amounts of formic acid or acetic acid, which are mixed with the latex thoroughly. The coagulum is then passed through rollers for removal of some quantity of water with

Plate 15. A HEADLOAD OF COTTON IN GUJARAT

(*see page 45*)

Plate 16. JUTE CROP

(*see page 47*)

dissolved impurities. Then smoking and drying processes are undertaken. The resulting product is the "smoked sheet" which is transported to factories for utilisation in the making of many rubber products. The area under rubber plantations is 0.35 million acres; the annual production is about 58 million lbs.; over 90 % of the area and production belongs to the state of Kerala.

CHAPTER VI

LAND-USE AND SELF-SUFFICIENCY

IN THE COUNTRY as a whole the nature of land utilisation has been largely "unplanned" and whimsical. Often changes have been made in response to temporary price fluctuations of crops. Planning based on regional and national needs, land capabilities and scope for optimum production, would improve the conditions enormously. Such planning is possible only on the basis of land-use surveys, which could be successfully completed only if the Government of India takes the initiative. This would take some years. In the meanwhile modifications in the present methods could be adopted; these should aim at increased production at home and decreased dependence on foreign sources. Some suggestions in this respect are made in the following paragraphs of this chapter.

In land-use efforts the interest of the private sector is naturally limited; it is the public sector that should plan and improve conditions.[1]

While the public sector could plan and improve conditions, the actual ownership and management should be with private individuals or groups. The immediate needs are sound advice and fertilisers; advice regarding application of the required fertilisers, crop-rotation or interculture, seed selection and all other details of scientific intensive farming can be given by the Government through agents or pamphlets or both. The government should be able to encourage production of fertilisers, especially nitrogenous fertilisers, and arrange for their procurement from abroad, if necessary, on barter basis. In this connection the

---

[1] The experience of the world has been that extensive areas owned and managed by public sector have, invariably, yielded poorer returns than equal areas owned and managed by private sector; the Soviet Union and Communist China are good examples, where public ownership and management has proved unsuccessful.

possibility of increasing the supply of fertilisers by the use of fish-meal made out of Indian-catch of fish needs examination.[1] The Bay of Bengal and the Arabian Sea, being in Tropical waters, have a large variety of fish. The fish could be not only the food of the land but also of the people, who lack protein very much.

Another direction in which the land-use, in the immediate future, needs re-orientation is that of horticulture. According to one estimate[2] less than one percent of the total cropped area in the country was under fruit trees in 1957-58. Fruits and vegetables must be grown in much larger quantities and should become part of the regular food consumed by, at least, the middle and upper classes of people. The annual production of fruits in the country is about 50 million quintals; about one quintal for every eight persons for the whole year, or 12.5 kilograms per person for the year. Actually this much is not available for each individual because about a quarter of the total production (by weight) is lost in storage, transport and as peelings; of the rest about a third is exported; so only 6-7 kilos per person per year is available for consumption;[3] in actual practice most of this is consumed in urban areas by the wealthier 10% of the population. Increased production must be achieved largely by individuals and small groups on limited plots only. The need is to grow for local consumption rather than for export; then only pressure on cereal foods would decrease; then only the health of the larger numbers would improve.

Growing of vegetables, especially on back-gardens and other unused plots, should be encouraged. Advice regarding the right type of vegetables for the areas, and seasons, would be of great value to most middle class families. In rural areas consumption of vegetables is very low; most of the vegetables are transported

---

[1] Peru has increased, in recent years, the catch of anchovy, which forms the foundation of large exports of fertilisers and high protein food to Europe.

[2] Randhawa M.S. : *Agriculture and Animal Husbandry in India.* p. 266.

[3] This compares poorly with 100-120 kilograms per person per year in countries of the Western Europe and U.S.A.

directly from collecting centres in rural areas to the nearby city.[1] The illiterate people of the rural areas need advice; they must be advised to retain half of the fruits and vegetables they produce for their own consumption; what they lose by this practice can be earned by products of cottage industries that they should be encouraged to develop.[2]

Rural electrification, mainly for increasing pump-irrigation, needs to be stepped up. In some states, like Madras, this has been done to a very satisfactory extent; in others, like Maharashtra, this aspect of agricultural need has been largely neglected. Power for irrigation must be made available in all states; the cost of such power must be reasonably low. The use of bullocks and camels in the "mhote" type of irrigation must be given up; this is a slow process and cannot achieve the efficiency that power-pumps can.[3]

In this context the mechanisation of farming techniques deserves serious consideration. In Indian agriculture the scope is not too great; but upto the possible extent it should be adopted. This would release a large number of animals from the field; these animals themselves prove a strain on the fodder resources of the country;[4] they should be destroyed.[5] It is less cruel to destroy them than keep them alive in a half-starved condition and make them do such hard work.

The general belief that more land should be given to cash crops must be rejected. The demand for cereals, especially rice,

[1] For six to eight months in the year 100-150 truck-loads of vegetables enter Bombay every 24 hours from the surrounding areas.

[2] The author has seen in two or three villages, in Maharashtra, villagers making tough ropes out of the fibre of the cacti plants, which grow abundantly in semi-arid areas; each length of the rope fetches about 75 paise; a family of four made about 4-5 lengths per day; a length is about 4 metres.

[3] The increasing supply of diesel oil from Indian sources makes possible the use of diesel engines for pumping water; this is a supplementary source of power for irrigation. But, however, for a mechanical or electrical pump to be efficient and economical, the holdings must be much larger.

[4] All the fodder available in the country should be given to dairy cattle which are so essential for the supply of milk and milk products; these animals should get very good feed.

[5] This is not, however, a practical solution (*Editor*)

is such that it must be met internally[1]; there are not many countries in the world that can export large quantities of rice to India regularly; moreover dependence on foreign food supplies must be eliminated. If this is realised, the area under food crops must be increased, if necessary, at the expense of cash crops. The need of the next decade would be to increase production of rice and wheat somehow (by increased area or increased yield per acre) and to drastically cut the rate of population-growth.[2]

A certain amount of efficiency in land use can be achieved by consolidation of holdings. By the end of 1962 about 30 million acres had been consolidated—mostly in the Punjab and Uttar Pradesh. Consolidation is only a remedial measure and its scope is limited. With the highly fragmented holdings that are the feature of this country an immediate step would be a preventive measure prohibiting further fragmentation; to this must be added encouragement of re-adjustment in holdings; the latter must be purely voluntary. Increased agricultural production could come only by more intensive farming methods and additional land for agriculture. Any expectation of significant increase in production by drastic changes in holdings or forced co-operative farming is not justified. The Indian people are essentially democratic in character and highly individualistic in temperament.

Considerable increase in areas under irrigation has to be made especially in some of the larger states (like Madhya Pradesh, Rajasthan and Maharashtra) that have marginal precipitation. An examination of the following table reveals large investments on irrigation projects, the area irrigated and the effectiveness of investment in achieving objectives.

---

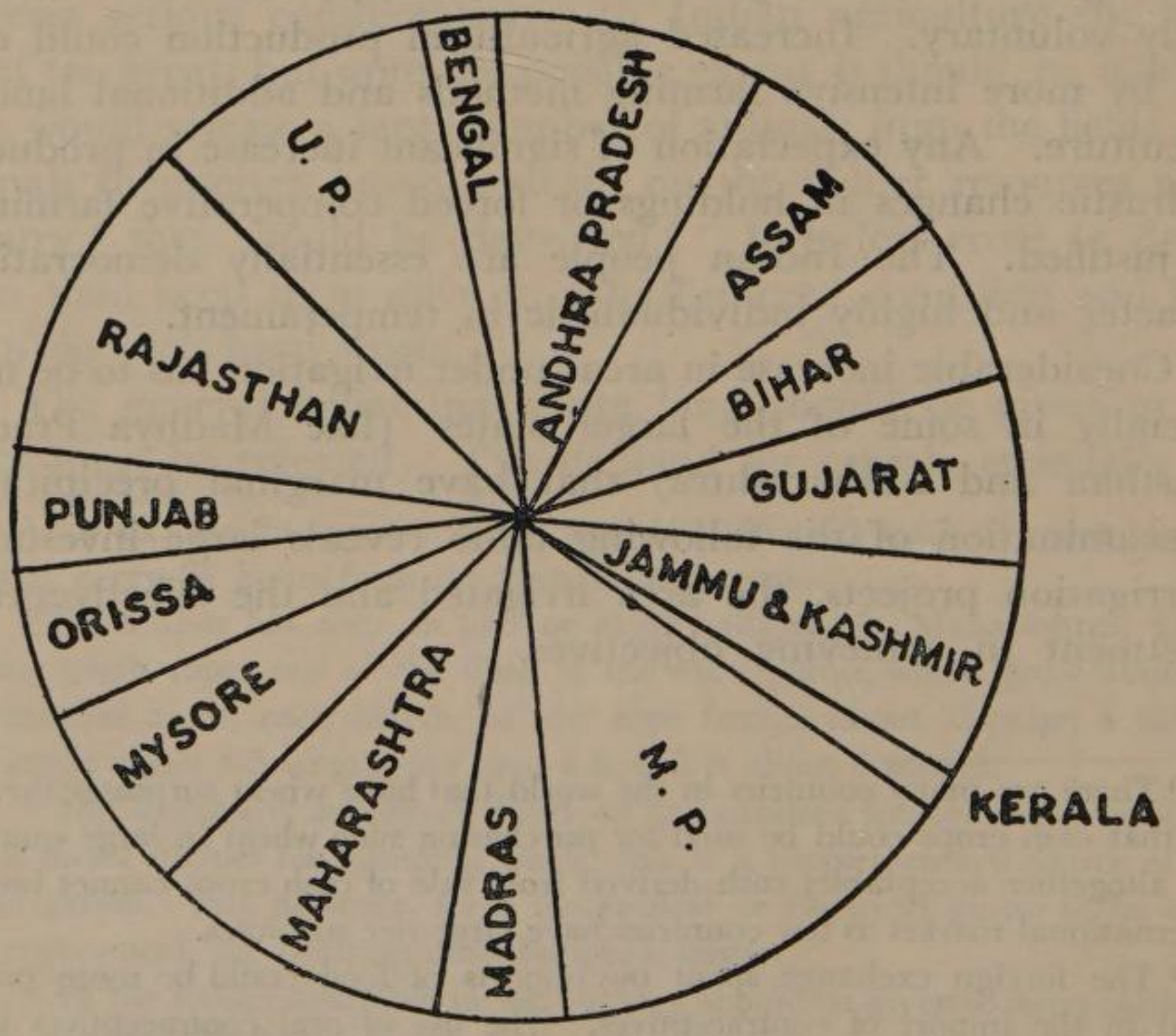
[1] There are many countries in the world that have wheat surpluses; the argument that cash crops could be used for purchasing such wheat in large quantities is not altogether acceptable; cash derived from sale of cash crops cannot buy rice in international market as few countries have large rice surpluses.

[2] The foreign exchange spent on imports of food could be more properly utilised in the import of contraceptives. The use of oral contraceptives in the rural areas appears to be the most effective method of controlling population growth.

	upto 1963		*General Effectiveness of outlay in achieving Irrigated area.*
	Total Outlay (Million Rupees)	*Area Irrigated (Thousand acres)*	
Andhra Pradesh	233	683	1 : 3
Bihar	53	991	1 : 19
Gujarat	39	88	1 : 2
Jammu & Kashmir	12	18	2 : 3
Kerala	139	428	1 : 3
Madhya Pradesh	29	393	1 : 13
Madras	238	834	2 : 7
Maharashtra	126	293	1 : 2
Mysore	163	267	2 : 3
Orissa	3	140	1 : 46
Punjab	284	6549	1 : 23
Rajasthan	51	97	1 : 2
Uttar Pradesh	396	5916	1 : 15
West Bengal	218	782	1 : 3

Source : *INDIA 1964—A Reference Annual.*

While Madhya Pradesh is the largest state in the country its outlay on irrigation works is lower than those of eleven other states;



PROPORTIONATE AREA OF THE STATES

the area irrigated in the state is less than those of seven other states; in other words, the largest state in the country, with considerable areas of marginal precipitation, has invested on irrigation projects very much less than other states (like West Bengal and Madras) that have less than a third of its area and more adequate precipitation. Other states, like Rajasthan and Maharashtra, have been equally poor in appreciating the need for much greater outlays on irrigation projects.

Another aspect revealed by the above table is that of effectiveness of outlay in achieving irrigated areas; Orissa and Punjab have achieved much in this respect; Gujarat, Rajasthan and Maharashtra show poor achievement. A combination of geographical and administrative capabilities has, thus, resulted in the smaller states like West Bengal, the Punjab and Madras coming out as outstanding producers of food grains in the country. This imbalance must be reduced and a greater productivity achieved by the larger states that have marginal precipitation.

CHAPTER VII

DEVELOPMENT OF INDUSTRIES

INTRODUCTION

INDUSTRIAL ESTABLISHMENTS, employing large number of workers, and aimed at mass-production of commodities, have been a feature of the 20th century in India; their development might be considered as due to, and also inspite of, British rule in India. The period of British rule provided for India the opportunity to get into contact with the Western industrial civilization; at the same time the rulers were not too keen to encourage industrialization in the sub-continent. Upto 1947, therefore industrial development was uneven, and jerky.

Cottage industries and small scale industries had, however, been a feature of human activity in the sub-continent for many centuries, long before the first Briton landed on Indian soil. Skilled workers of India had been known to produce remarkably good (quality) metal-ware, fabrics and toilet-articles for over 2000 years. In other words, this country was meeting the needs of its people by its own cottage and small scale industrial production as satisfactorily as some of the enterprising countries of Western Europe, upto about the end of the 18th century. Industrial revolution in Britain, and in Western Europe, had started a new pace of production, and a great variety of consumer-goods, by the end of the 18th century. During the 19th century, India, and some other parts of the world, began feeling the impact of this new development in industrial production. Simple living, with few wants, started slipping, giving place to apparently comfortable modern living, with many wants.

By the beginning of the 20th century this country had started appreciating the advantages of the new developments in industrial production. Britain, rather reluctantly, had to permit some expansion in industrial production, especially during the two world wars. When British control over India ceased in 1947 the Indian

Government felt free to adopt all the new developments in industrial production that Western Europe and the United States had evolved. Within a decade a good number of large industrial establishments were partially, or wholly, completed; many of these were in the public sector; before the end of the second decade after independence (by the end of 1965), the people (more than the government) were realizing that too much money and attention had been given to industrial expansion; especially in the public sector.[1]

For the development of large-scale industries the country possesses many natural advantages—minerals like coal, iron-ore, manganese, mica and bauxite; substantial deposits of limestone, coastal sands (in Kerala) rich in thorium and titanium; potential and developed water power ; building material; plenty of labour, skilled and otherwise; an expanding home-market; a central location in the "old world" enabling trade with a large number of Asiatic, African and European countries, which are more "underdeveloped" than herself.[2]

With aid, in the form of "know-how" and initial machinery, coming from U.S.A., West Germany, U.K., Soviet Union and numerous other countries, India has been able to achieve considerable development in all types of modern industry. Tables VII to XIII indicate the range of achievements in industries.

POWER

Industries need a lot of power derived from any, or all, of the major sources—Coal, Petroleum and Gas, and Water. In India all are available though not in very large quantities. Their occurrence, however, is such that they do not all concentrate in one part of the country. While most of the coals, both in quality as well as in quantity occur in the north east quarter (Bihar-Bengal-

---

[1] India's planning might be contrasted to that of Taiwan (Formosa); during approximately the same period of time the latter had stabilized its agricultural production and was moving forward as an industrial producer.

[2] Early in 1966 India agreed to supply 2000 railroad wagons to Hungary at an approximate cost of Rs. 65 millions only; the wagons are to be supplied by a private firm in West Bengal.

Orissa borderlands), the petroleum fields are in Gujarat and Assam; the developed and potential water-power belongs mainly to the Himalayan and Peninsular ranges.

COAL

Indian coals are largely medium quality ones belonging to the bituminous variety. The coals belong to the Gondwana system (Carboniferous period) and occur in an area stretching over Bihar, Bengal, Orissa and Madhya Pradesh. The coal formations are associated with the depressions along the major river valleys in this area. The following are the important fields :

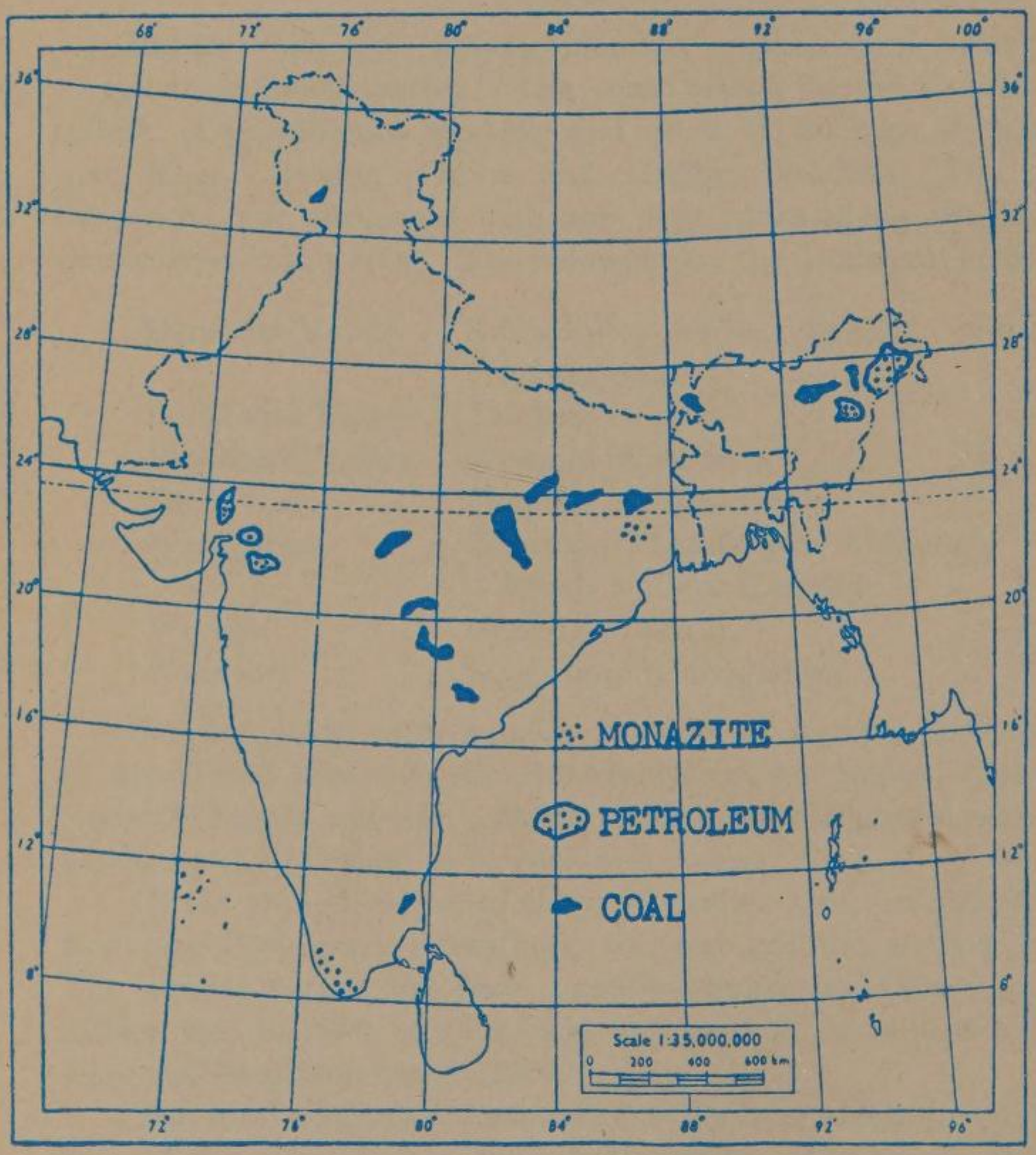
Damodar Valley	Raniganj, Jharia, Bokaro, Giridih, Karanpura.
Brahamini Valley	Talcher.
Mahanadi Valley	Rampur-Himghir.
Sone	Umaria, Korar.
Wainganga	Bisrampur, Lakhanpur, Mohpani, Pench Valley, Kamptee.
Wardha	Chanda, Tandur.
Godavari	Singareni, Kothagudam.

Smaller fields, with smaller reserves of tertiary coal occur in Assam and Kashmir; the important fields are Jaipur, Makum, Nanchik, Ladda and Riasi. Poorer quality coals (Lignites) occur in Madras and Rajasthan at Neyveli and Palana.

Of the annual output of about 70 million tons, about 97% is from the Gondwana formations; the rest are the tertiary ones. The annual output has been steadily increasing from about 6 million tons in 1900, to 24 million tons in 1930, 32 million tons in 1950 and 70 million tons in 1964.

The total reserves are estimated to be over a hundred billion tons; of this only 2% is metallurgical quality. The known reserves of metallurgical quality coal can support the expanding steel industry only for another half a century. In order to conserve superior coals, and maintain the progress in steel production, washeries are being constructed for separating higher grade coal

Map 13 Power Minerals



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

from poorer grades; the latter are high in ash content and can be used profitably for generation of power. Present plans envisage the development of a chain of giant power stations, with generating capacity of 200 to 500 mw. or more, utilizing the high-ash coals near the coal fields.

At the integrated Neyveli Lignite Project an annual production of $3\frac{1}{2}$ to 4 million tons of lignite is possible; the plan is to develop a quarter of a million kw. thermal power, derive 150 thousand tons of Urea (to be utilized as chemical fertilizer) and prepare 400 thousand tons of carbonized briquettes for use as domestic and industrial fuel. An interesting feature of the Neyveli lignite fields is the occurrence of the lignite in association with a considerable overburden and an extensive artesian pocket. It may be observed that the lignites, and other tertiary coals, can play an important part in the industrial development of the country for not more than 3 to 4 decades. The southern, western and north-western parts of India must rely, in the long run, on petroleum and hydro-electricity for continued industrial progress; this would apply to Assam also.

In general it may be said that the country has realized the need for careful utilization of coal; the recent discoveries of petroleum pockets in Gujarat and Assam have helped this by making possible the use of diesel oil as an alternative source of energy to coal. There are prospects of discovering new pockets of petroleum and natural gas; the completion of some of the larger hydro electric projects would also relieve the pressure on coal.

PETROLEUM

The term is used to describe a liquid hydrocarbon of complex chemical composition; in its crude form petroleum includes compounds belonging to the Paraffin and Benzene groups, along with unsaturated hydrocarbons. Usually pockets of petroleum are found associated with some gas also; this (Methane, Ethane etc.) is called "natural gas." In areas of sedimentary rocks that have experienced folding and displacement the presence of natural gas helps in easier extraction of petroleum from the under-

ground pockets. Petroleum has an organic origin; bacterial and biochemical action on organic matter derived from microscopic forms of plants and animals, that had existed in shallow seas or swamps many thousands of years ago, lead to formation of various hydrocarbons.

In India the coastal plains, parts of the Ganga-Brahmaputra plains and parts of Rajasthan, were under shallow seas in the lower and middle Tertiary Era; these are the likely sources of Petroleum in this country; some of these, as in Assam and Gujarat, are already yielding valuable mineral oil. To help systematic search for petroleum, the Government of India set up in 1956 the Oil and Natural Gas Commission. The O.N.G.C. has been able to get the assistance of many foreign experts in exploring for mineral oil and natural gas. By 1964-65 the country's own production of crude petroleum had moved upto more than a million and a half tons; this might be compared to less than a quarter million tons in 1948-49. During the same period the consumption of petroleum products had jumped from 3 million tons to over 12 million tons; the refining capacity in the country had moved from less than quarter of a million tons to about 10 million tons. In 1948-49 only one small refinery operated in Assam; by 1964-65 five large ones were operating.

The two important areas producing petroleum are Assam and Gujarat. In Assam the north-eastern section (generally called Upper Assam) has been yielding petroleum for over a quarter of a century; the main fields are Digboi, Nahorkatiya, Hugrijan and Moran; the oil pockets occur at the base of Tipam sandstones which have been sharply folded and at places faulted. The oil occurs at varying depths ranging from 1000 to 3500 meters. The surface area of exploration is about 3000 sq. kms. In Gujarat, around the Gulf of Cambay a large basin of lower Tertiary sediments, enclosing petroliferous horizons, rest upon a faulted surface of the traps; this appears to stretch from Bhavnagar to Baroda in E-W direction, and Surat to Palanpur in S-N direction; the surface area for exploration is roughly 50,000 sq. kms.

The refining centres are Bombay, Baroda, Vizagapatnam, Gauhati and Barauni, in Maharashtra, Gujarat, Andhra Pradesh,

Assam and Bihar respectively. Two refineries at Bombay (ESSO and SHELL) and one at Vizagapatnam (CALTEX) are private enterprises; the others are the Government of India undertakings. The total refining capacity is about 10-12 million tons. At present a fifth of this capacity is met by internal crudes; the rest comes from countries of south west Asia. The plan is to increase the production of internal crudes and feed the public sector refineries; the three private sector refineries would continue to refine imported crudes for a considerable time.

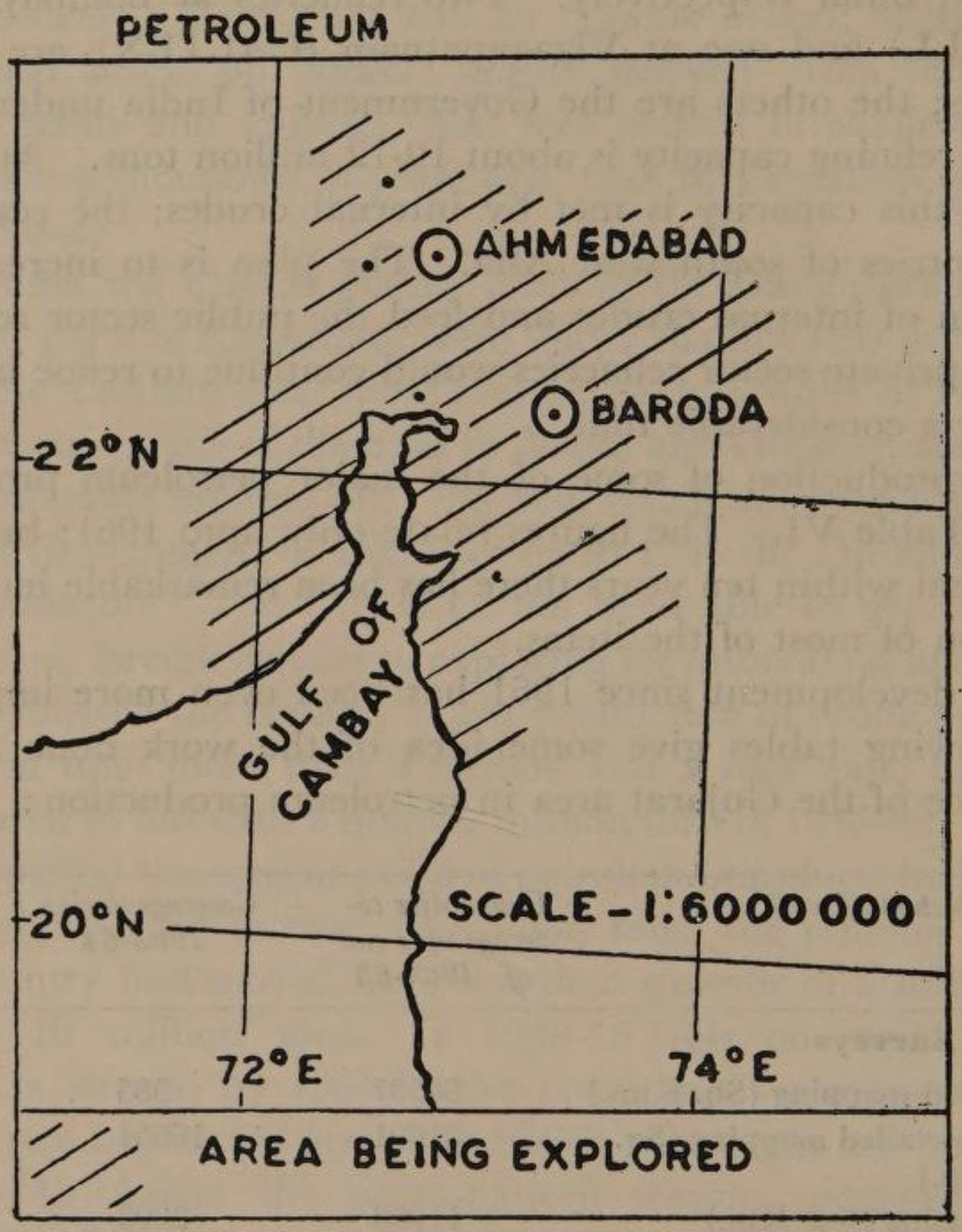
The production of some of the major petroleum products is given in Table VI. The figures relate only upto 1961; but it can be seen that within ten years there has been remarkable increase in production of most of the items.

The development since 1961 has been even more impressive. The following tables give some idea of the work done and the importance of the Gujarat area in petroleum production :

Nature of work	*Cumulative coverage upto end of 1962-63*	*Coverage during 1963-64*	*Total*
Geological Surveys			
Detailed mapping (Sq. Kms.)	30587	585	31172
Semi-detailed mapping (Sq. Kms.)	81691	16651	98342
Traversing (line Km.)	11068	2203	13271
Geophysical Surveys			
Seismic Surveys (line Km.)	20846	5592	26438
G.M. Surveys (stations measured)	98558	18341	116899

WELLS COMPLETED FROM 1957-58 TO END OF SEPT. 1964

Area	*Oil*	*Gas*	*Dry*	*Under test or to be tested*	*Total*
Gujarat	144	28	27	47	246
Assam	5	—	3	5	13
Other areas	—	1	6	—	7
	149	29	36	52	266



Structures which have been tested and proved to be oil/gas bearing have been found in recent years at the following places :

Cambay ..	..	.. Gujarat State.
Ankleshwar	..	.. ,,
Olpad ..	..	.. ,,
Kalol ..	..	.. ,,
Sanand ..	..	.. ,,
Nawagam ..	..	.. ,,
Rudrasagar	..	.. Assam
Lakwa ..	..	.. ,,

HYDRO-ELECTRICITY

The perennial streams of the Himalaya provide considerable amount of power and possess potential power. The Bhakra-Nangal scheme is an example of such power production from one Himalayan river, the Sutlej. In the peninsular India the Sahyadri and Anaimalai ranges provide head for power generation; but the streams have a remarkable seasonal variation in volume of flow. Large dams across these rivers, sometimes more than one large dam across the same river, have made possible the conservation of monsoon waters for use during the whole year. The Cauvery is an example of the peninsular river yielding considerable amount of power.

Many rivers are yet to be tapped for power. Schemes are naturally multipurpose ones because the regulated release of conserved water can yield not only power but also crops through its being used for irrigation. The total installed capacity of generating plants for the whole country and the individual states is indicated below:

INDIA	1951	..	575000	kw.
	1956	..	1061000	kw.
	1961-62	..	2419000	kw.
	1962-63	..	2916000	kw.
Andhra Pradesh	1961-62	..	166150	kw.
Assam	1961-62	..	9270	kw.
Bihar	1961-62	..	44000	kw.
Gujarat	1961-62	..	19612	kw.
Kerala	1961-62	..	147500	kw.
Madhya Pradesh	1961-62	..	69000	kw.
Madras	1961-62	..	450450	kw.
Maharashtra	1961-62	..	281914	kw.
Mysore	1961-62	..	187200	kw.
Orissa	1961-62	..	123005	kw.
Punjab	1961-62	..	469476	kw.
Rajasthan	1961-62	..	—	kw.
Uttar Pradesh	1961-62	..	192470	kw.
West Bengal	1961-62	..	67208	kw.

The pattern of power development is as follows:

(*a*) Kerala, Mysore, Orissa, Punjab, Jammu & Kashmir .. Mainly hydro

(*b*) Gujarat, Rajasthan, Bihar and West Bengal .. Mainly thermal

(*c*) Madras, Andhra Pradesh, Maharashtra, Madhya Pradesh, Uttar Pradesh and Assam .. Thermal & hydro

According to one estimate the river basins of India have an aggregate hydro electric potential of the order of 40 million kw. at 60% load factor; this is made up of:

Westward flowing rivers of the Sahyadri—Anaimalai ranges—4.0 million kw.

Eastward flowing rivers of Southern India—8.5 million kw.

Central Indian rivers—4.0 million kw.

Ganga Basin (excluding the potential in Nepal)—5 million kw.

Brahmaputra and other North Eastern rivers—12.5 million kw.

The Sindhu (Indus)—6.5 million kw.

By the end of the year (1965) the developed hydro electricity in the country may be considered as 10% of the total potential. Punjab and Madras, comparatively small states, stand at the top of all states in this installed power. These two States must depend on hydro-electricity as the only main source of power for a long time—since their coal and petroleum resources are negligible. Maharashtra, which takes the third place, is a large State and can increase its hydro-electricity production to a considerable extent.

The following are some of the major power projects partly or wholly completed since 1950:

1. Machkund Project — A joint venture of the Governments of Andhra Pradesh and Orissa, this hydro-electric project harnesses the river Machkund which forms the boundary between the two

Plate 17. MANGO

(*see page 51*)

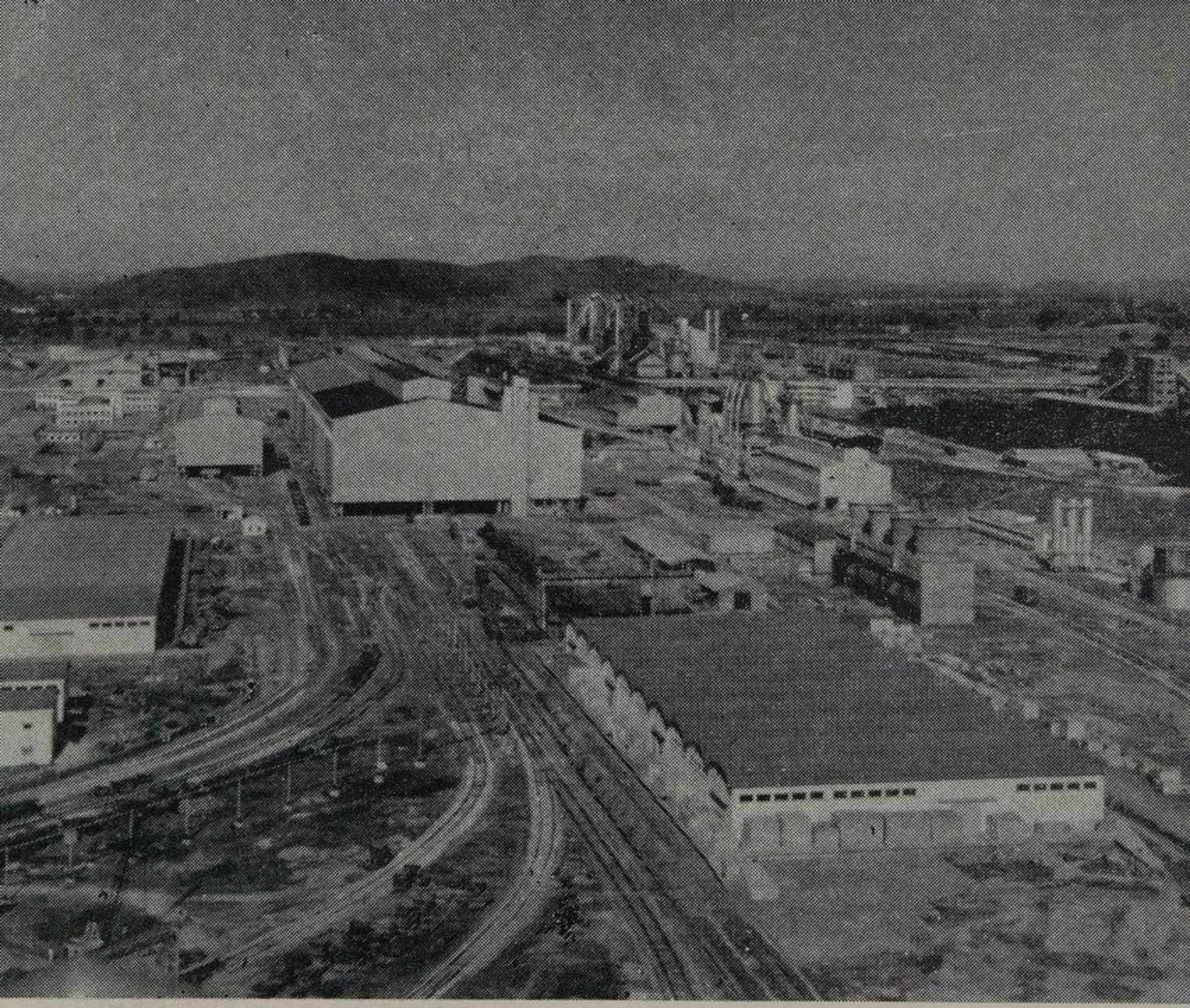


Plate 18. IRON AND STEEL INDUSTRY — ROURKELA

(*see page 73*)

States. A dam, 176 ft. high above foundations and 1,345 ft. long, has been constructed at Jalaput across the Machkund river to store 6,25,000 acre-feet of water. Three generating units of 17,000 kw. each and three units of 21,250 kw. each have been commissioned. The total installed capacity of the power station is now 1,14,750 kw.

2. Srisailam Hydro-electric Project — The Srisailam project (cost Rs. 385 million) envisages the construction of a 385 ft. high and 1,685 ft. long stone-masonry dam across the Krishna rivers, about 64 miles upstream of Nagarjunasagar dam site. The releases from the reservoir are proposed to be utilised for power generation at a station at the toe of the dam, with an initial installation of four units of 100 mw, and with provision for adding three such units at a later stage. The first two units are expected to be commissioned in 1968-69 and the other two in 1969-70 and 1970-71 respectively.

3. Iddiki Hydro-electric Scheme — The project located in the high range of Periyar about 100 miles south-east of Ernakulam envisages (i) a common storage reservoir formed by two main dams, one 530 ft. high across Periyar at Iddiki Gorge and the other 435 ft. high across Cherutoni, a tributary of the Periyar, (ii) a power house with ultimate installed capacity of 8,00,000 kw. with 8 units will be commissioned in 1969.

4. Mettur Tunnel Hydro-electric Scheme — The scheme (cost Rs. 89 million) provides for the utilisation of the discharge of 20,000 cusecs from the Mettur Reservoir during the irrigation period for power generation by installing four units of 50 mw. each.

5. Koyna Project — The first stage of the project, inaugurated in January 1954, (cost Rs. 382 millions) envisages the construction of a 208 ft. high dam across the river Koyna and a tunnel for diverting the waters of the river to ensure a drop of about 1,570 feet. The underground power house has four units of 60,000 kw. each, all of which have been commissioned. The project supplies power to Bombay-Poona area and the adjoining districts.

6. Sharavathi Hydro-electric Project — The Sharavathi Valley project is proposed to be developed in two stages. The

first stage consists of the construction of a 194 ft. high dam near Linganamakki village with a reservoir capacity of 156 billion cft., and installation of two generating units of 89,100 kw each. The second stage contemplates raising the dam and installing six more generating units of 89,100 kw. capacity in the Sharavathi power station. The two units of the first stage and the first unit of the second stage are already completed.

7. Bhakra Right Bank Power Station — In order to utilise the power potential available at Bhakra dam and to cater to the growing load demand in the Punjab, Delhi and Rajasthan areas, it has been decided to construct a power house (cost Rs. 308 millions) on the right bank of river Sutlej at the foot of the dam. The power house will have four generating units of 70,000/1,20,000 kw. each.

8. Yamuna Hydel Scheme — The scheme proposes to harness the river Yamuna and its tributary tons in two stages. Under stage I there will be two power houses on the power channel, one at Dhakrani and the other at Dhalipur with an installed capacity of 33,750 kw. and 51,000 kw. respectively.

Stage II envisages the construction of a diversion dam 47.6 metres high near village Ichari or river Tons, situated 28.8 km. upstream of its confluence with Yamuna. An underground power house at Chibro below the left bank of Tons with an installed capacity of four units of 60 mw. each (part I) and four of 24 mw. each (part II). The units under stage I are expected to be commissioned in 1966 and those under stage II in 1971.

9. **Rihand Dam Project**—The Rihand project includes the construction of a concrete gravity dam about 300 ft. high and 3,065 ft. long across the river Rihand near the village of Pipri in the Mirzapur district of Uttar Pradesh, about 29 miles south of the confluence of the Rihand and the Sone rivers. The reservoir, to be created by the dam, will store 8.6 million acre-ft. of water. A power station with an initial capacity of 0.25 million kw. has been constructed. Its ultimate installed capacity will be 0.3 million kw.

OTHER SOURCES OF POWER

Besides coal, petroleum and water, there are some other sources of power which help industries; these include charcoal, certain types of combustible wastes and nuclear energy. Of these the last is yet to be developed[1]. Charcoal is being used in some of the smaller industries in places where coal or other sources are not economically obtainable. The small iron and steel works at Bhadravati (Mysore State) has been using charcoal for many decades. Some of the sugar mills use the cane-waste (after the extraction of cane juice) as fuel for deriving steam power. With the development of technology it is possible to use solar energy also to some extent; in this context the development (in Israel) of an all-purpose small unit turbine which can convert any source of heat into power is interesting and needs to be studied[2].

UTILISATION OF POWER

Power derived from all the sources, already considered, forms the foundation of many activities, industrial, transportational, communicational and agricultural; it also serves in the office or factory. The total energy generated and the nature of consumers is indicated below:

A. POWER GENERATION

Energy generated (million kwh.)	*1950-51*	*1955-56*	*1960-61*
(*a*) State owned	2100	4500	10930
(*b*) Company owned	3000	4300	5920
(*c*) Self generating industrial establishments.	1470	2000	3190
Total	6570	10800	20040

[1]A nuclear power station is being constructed at Tarapur, near Bombay. It will consist of two reactors, each producing about 200 mw. of power.

[2] *News From Israel*, (*Dec. 15, 1965*) Vol. XII, No. 24.

B. ELECTRICITY CONSUMPTION (1962-63)

Nature of use	*Number of consumers in thousands*	*Percent of total*
Domestic	4303	75.50
Commercial	914	16.04
Industrial	211	3.70
Public lighting	18	0.32
Irrigation and other agricultural use	253	4.44
Total	5699	100.00

CHAPTER VIII

DEVELOPMENT OF INDUSTRIES (*Contd.*)

IN THE TABLES VII to XIII achievements in selected industries have been shown; the tables reveal the variety of industries and, to some extent, the nature of progress in production. In the first set of industries (18 listed in table No. VII) six show poor annual production for the three year period, 1960-63. In the case of industrial machinery like sugar mill machinery, cement machinery and paper machinery, installed capacity has been increased year after year, while production has been increasing very slowly; the rate of increase in production has been much lower than the rate of increase in installed capacity. An examination of tables VII to XIII would show that actual production has increased very slowly even though installed capacity has been stepped up at a good pace in the following industries:

Steel wire ropes.
Alloy, tool and Stainless steel (finished).
Non Ferrous Metal—Zinc.
Sugar mill machinery.
Cement Machinery.
Paper Machinery.
Tractors.
Sugar.
Vanaspati.
Cotton Textiles—Cloth.
Rayon Crade pulp.
Electric Cables and Wires—A.C.S.R. conductors.
Dry Batteries.
Radio receivers.
Road rollers.
Boilers.
Railway Rolling Stocks—Locomotives.

Railway Rolling Stocks—Wagons (in terms of four wheelers)
" " " —Passenger Coaches.
Automobile and Ancillary Industries—Commercial vehicles.

Bicycles.
Ball and Roller Bearings.
Plywood—Tea-chest.
Clocks.
Time-pieces.
Watches.
Photographic films and paper.
Liquid Glucose.

The items listed above have a limited consumer market. One might say they represent the needs of 20% of the population—the wealthier 20%. Increased demand for these items could come only when a higher percentage of the population gets into the wealthier bracket (those getting Rs. 300 and above per month). Only with such increased demand can one expect an increased production, making for a better utilisation of installed capacity.

An examination of the distribution of industries reveals two dominant forces influencing the location of the industries; the concentration of the coal fields in the north eastern quarter has attracted most of the basic industries to an area enclosed by a circle, which would have Jamshedpur as the centre and approximate radius of 300 Kilometres (*map 16*) ; the older urban centres, with financial and political powers, have been able to attract many of the other (largely non-basic) industries. Consequently most of the larger industries (excluding iron and steel) are to be found in the hinterland/umland of the big urban centres—Ahmedabad, Bangalore, Bombay, Calcutta, Cochin, Delhi, Hyderabad, Madras and Vizagapatam; thus seven or eight states account for 75-80% of the larger industries in the country. The fundamentally important geographical factors (like topography, foundational structure and climate) have all along been guiding the location

of the industries—directly as well as indirectly. The importance of the industrial areas associated with Bangalore, Bombay, Calcutta, Cochin, Madras and Vizagapatam are largely based on geographical advantages they possess.

According to the industrial policy adopted by the government in 1956, industries specified in schedule *A* would be the exclusive responsibility of the state and central Governments while those specified under schedule *B* would permit participation by private enterprise. Industries not included in the two schedules are, in general, left to private enterprise. The following are the industries included in the two schedules:

Schedule A—Arms and Ammunition and Allied Items of Defence Equipment

Atomic energy.
Iron and steel.
Heavy castings and forgings of iron and steel.
Heavy plant machinery required for iron and steel production, for mining, for machine tool manufacture and for such other basic industries as may be specified by the Central Government.
Heavy electrical plant including large hydraulic and steam turbines; Coal and lignite; mineral oils.
Mining of iron ore, manganese ore, chrome ore, gypsum ore, sulphur, gold and diamonds.
Mining and processing of copper, lead, zinc, tin, molybdenum and wolfram.
Aircraft, air transport, railway and shipbuilding.
Telephones and telephone cables.
Telegraph and wireless apparatus (excluding radio receiving sets).
Generation and distribution of electricity.

Schedule B—Industries

Aluminium and other non-ferrous metals not included in Schedule A.

Machine tools.
Ferro-alloys and tool steels.
Basic and intermediate products required by chemical industries such as the manufacture of drugs.
Dyestuffs and plastics.
Antibiotics and other essential drugs.
Fertilisers.
Synthetic rubber.
Carbonisation of coal.
Chemical pulp.
Road transport.
Sea transport.

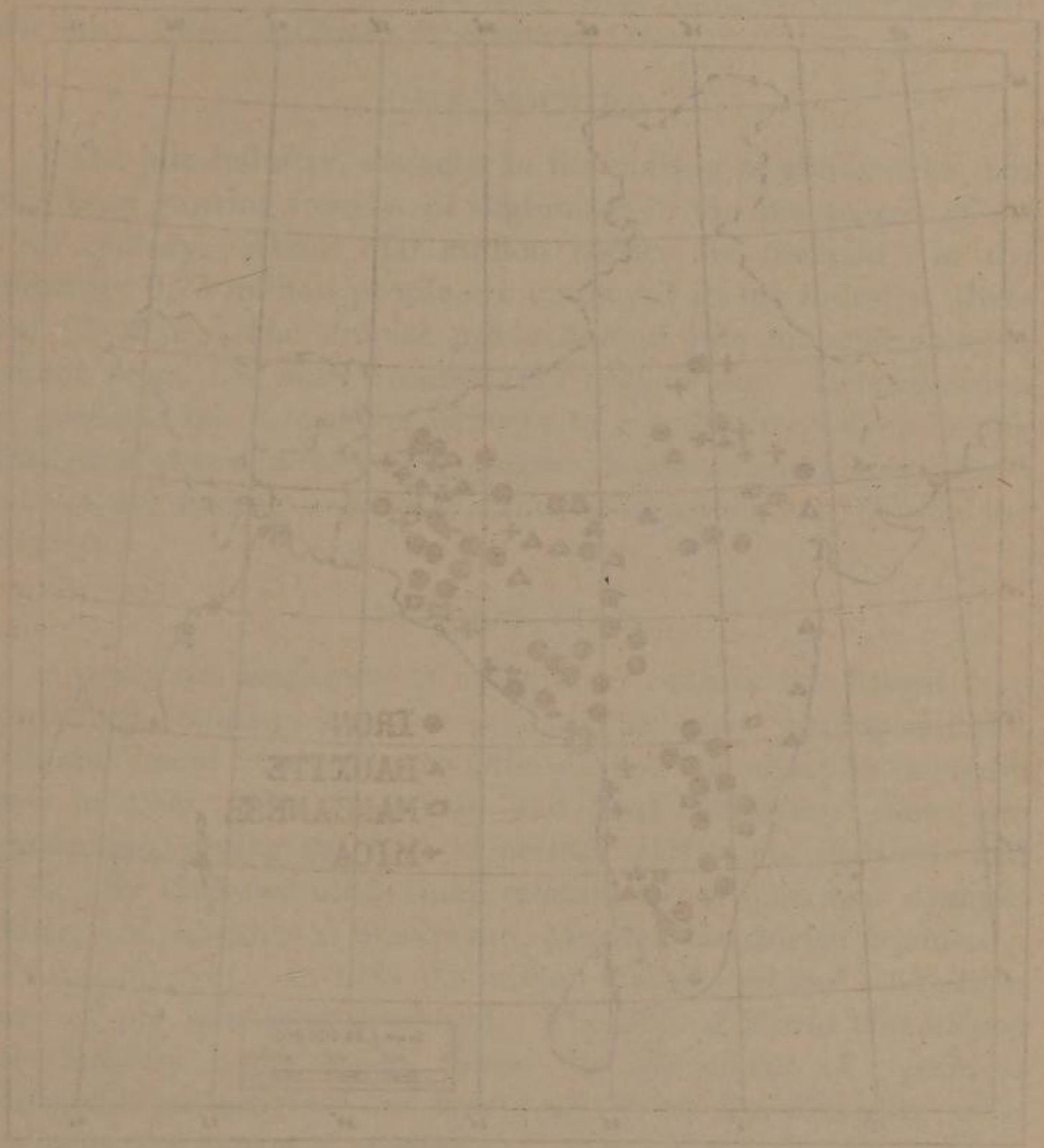
Funds for the industries under the two schedules are provided by the government concerned. Industries started by private enterprise are also eligible for aid from the Industrial Finance Corporation of India, the State Financial Corporations (15 in number), the Industrial Credit and Investment Corporation of India and the Refinance Corporation for Industry Ltd. In addition to these, financing bodies have been set up for aiding specific groups of industries, *e.g.*, textiles, films, etc.

TEXTILE INDUSTRY

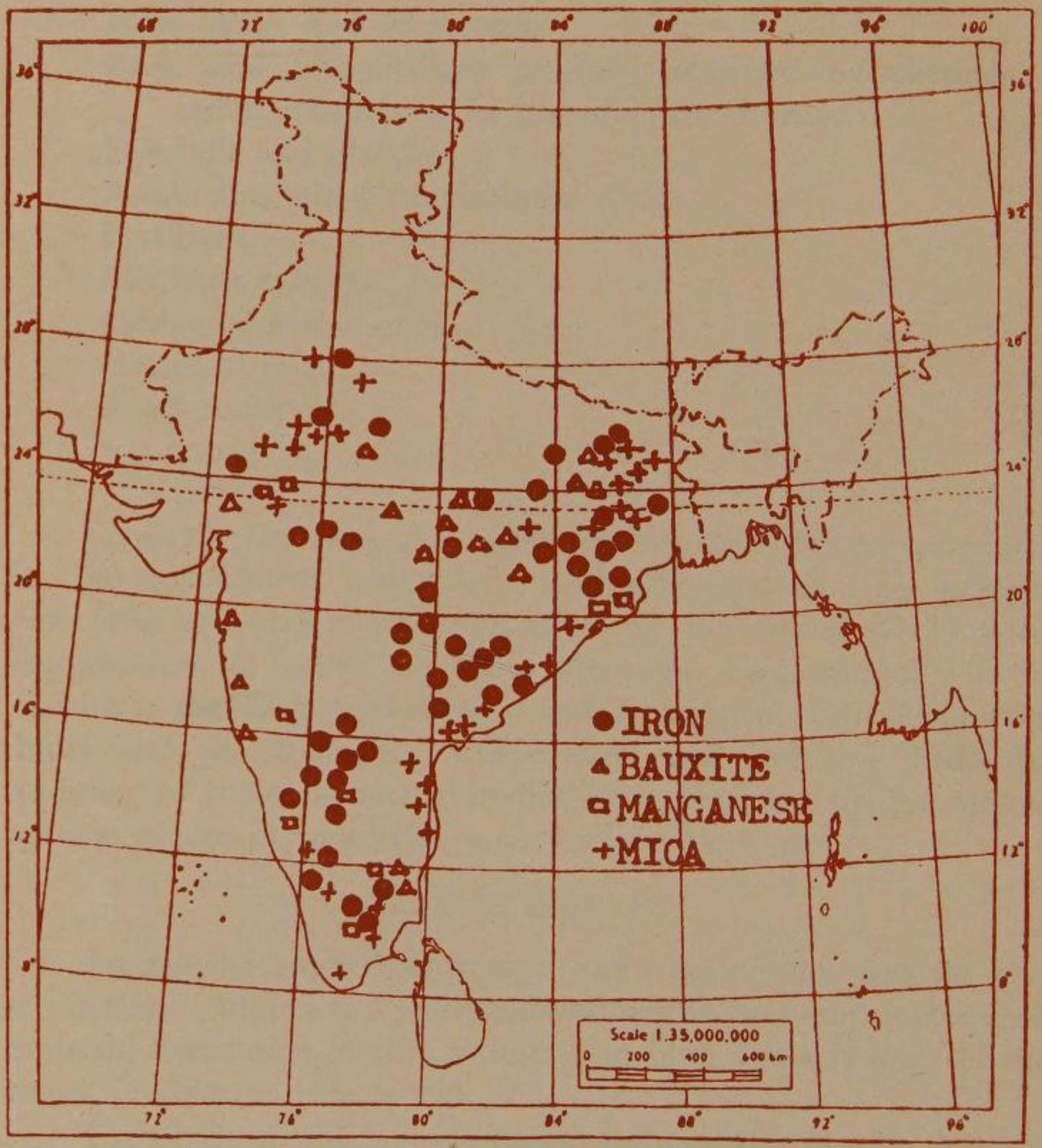
Among the larger industries in the country, this was the first to develope. Cotton and Jute produced within the country provided a strong foundation for the industry; in both India is one of the major producers in the world.

The cotton textile mill industry was founded in the last quarter of the 19th century; it has been growing ever since. About 1.25 billion rupees are invested in the industry; nearly 0.9 million workers are employed in the industry. Over 500 textile mills are operating; there are 14.1 million spindles and about 0.25 million looms. The 1963 production of the fabric amounted to a little over 5 billion metres[1]. Three states (Gujarat, Maharashtra,

[1] Handlooms and power looms accounted for another 2.5 billion metres for the same year.



Map 14 Four other Important Minerals



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.

Madras) account for a large part—over 75% of the total production. (*Refer to Chapter V, Section on Cotton.*)

JUTE INDUSTRY

The jute industry, engaged in the making of gunny cloth, has also been growing from small beginnings in the last quarter of the 19th century. About 400 million rupees are invested in the industry; 0.23 million people are employed in the industry; there are 95 mills. The annual production of jute manufactures, in recent years, has been around 1.25 million tons. Diversification of products has helped the industry to remain strong even during periods of peace in the world; carpets, linoleum and highly refined fabrics are finding a good market, both within and outside the country.

IRON AND STEEL

About the beginning of the present century the Bengal Iron and Steel company was the only establishment turning out this valuable metal for the country; the output was about 35 thousand tons in 1900. The Tata Iron and Steel Company came into production, during the 1911-13 period, turning out pig iron and steel. By 1939 two other small establishments (one near Asansol, Bihar, and the other at Bhadravati, Mysore) had started production of iron and steel. In 1939 0.8 million tons of steel and 1.8 million tons of pig iron were produced. The Second World War helped the industry considerably. Since the attainment of political independence progress has been very good; the following table indicates the nature of progress:

Year	*Pig iron*	*Finished Steel*
1955	1.75 million tons	1.26 million tons
1956	1.8 million tons	1.34 million tons
1961	5 million tons	2.8 million tons
1962	5.8 million tons	3.7 million tons

The sudden jump in production in recent years has been due to the functioning of three public sector plants at Rourkela (with W. German aid),[1] Bhilai (with aid from Soviet Union) and Durgapur (with British aid). These three plants, managed by the state-owned Hindustan Steel Ltd., are in the states of Orissa, Madhya Pradesh and W. Bengal respectively. Along with the growth of these three plants, the Tata Iron and Steel Company (TISCO) plant has also been expanding; TISCO plant is at Sakchi (now Jamshedpur) in Bihar. The Indian Iron and Steel Company (IISCO) plant is located at Hirapur near Asansol, West Bengal. The TISCO and IISCO form the two important plants belonging to private enterprise. The Mysore Iron and Steel Ltd., located at Bhadravati, in Mysor State, is the only plant that is managed by a State government.

About 7 billion (7,000 million) rupees are invested in this industry ; in other words Rs. 16 per head of the population is invested in this industry. There is an active proposal to invest another billion (1,000 million) rupees in a new plant to be established at Bokaro, in Bihar, with aid from the Soviet Union. The enormous investment in this industry, with considerable foreign exchange involved, can be justified only if there is good prospect of exporting steel and earning valuable foreign exchange[2]. Indian Steel should be able to compete with steels produced abroad, both in quality and in price.

ENGINEERING INDUSTRIES

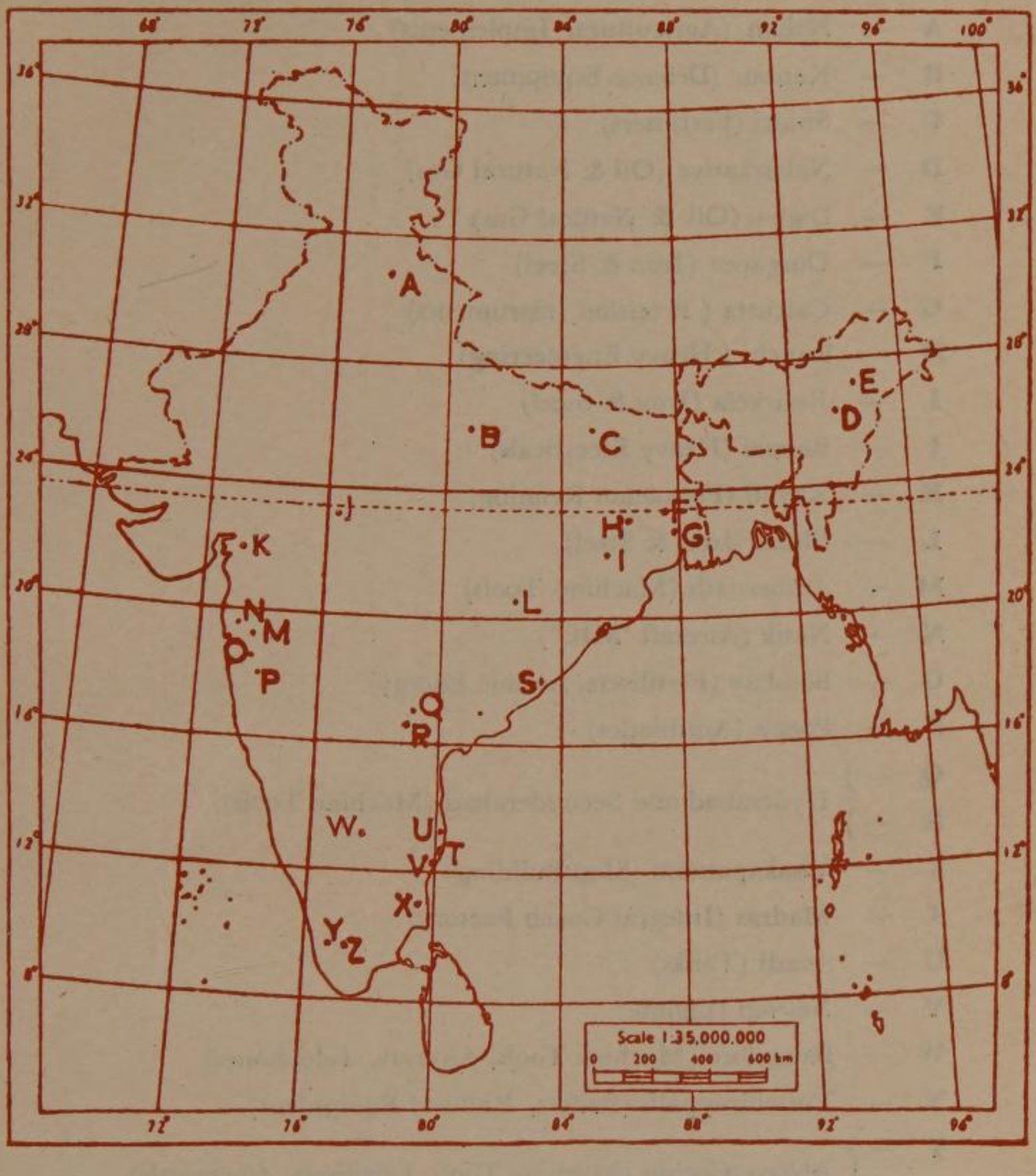
A large number of manufacturing industries, both in public and private sectors, have developed all over the country; these range from small one-man establishments to very large factory establishments; utilising an increasing amount of indigenous components they make a variety of engineering goods. An idea of the productivity of these industries can be obtained by referring

---

[1] The Rourkela plant has grown steadily and appears to be the most rewarding; in recent years it has shown earnings in excess of fifty million rupees.

[2] The exports need not be necessarily steel bars, sheets and the like; they could be manufactured items, like locomotives, wagons etc., made out of Indian steel.

Map 15 Major Industrial Undertakings in the Public Sector



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

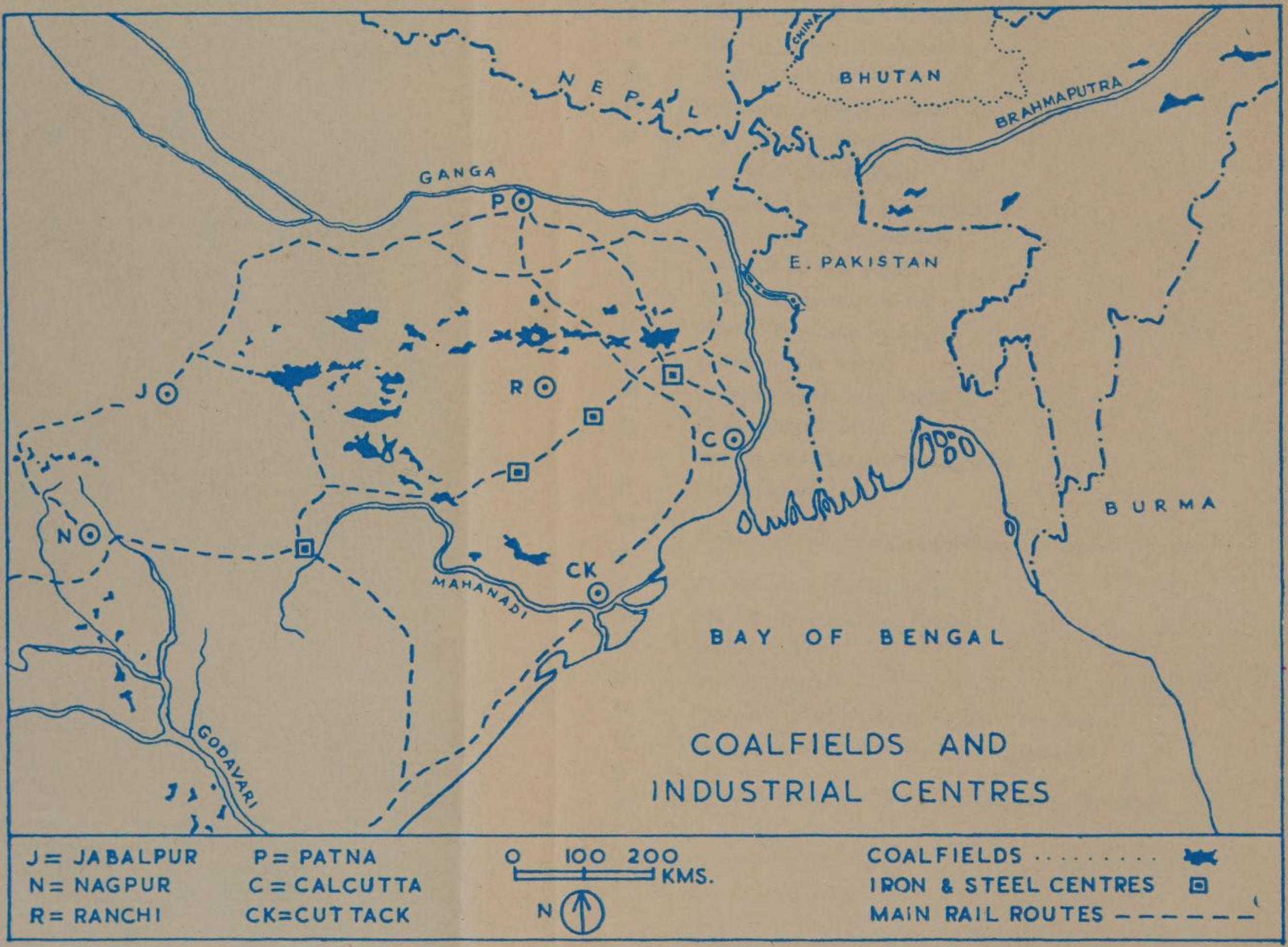
© GOVERNMENT OF INDIA COPYRIGHT, 1964.

(Key to map on the back)

KEY TO THE MAP

A — Nahan (Agricultural Implements)
B — Kanpur (Defence Equipment)
C — Sindri (Fertilisers)
D — Naharkatiya (Oil & Natural Gas)
E — Digboi (Oil & Natural Gas)
F — Durgapur (Iron & Steel)
G — Calcutta (Precision Instruments)
H — Ranchi (Heavy Engineering)
I — Rourkela (Iron & Steel)
J — Bhopal (Heavy Electricals)
K — Koyali (Petroleum Refining)
L — Bhilai (Iron & Steel)
M — Ambernath (Machine Tools)
N — Nasik (Aircraft 'MIG')
O — Bombay (Fertilisers, Atomic Energy)
P — Poona (Antibiotics)
Q — } Hyderabad and Secunderabad (Machine Tools)
R — }
S — Visakapatnam (Ship Building)
T — Madras (Integral Coach Factory)
U — Avadi (Tanks)
V — Neyveli (Lignite)
W — Bangalore (Machine Tools, Aircraft, Telephones)
X — Tiruchirappalli (Boilers, Railway Equipment)
Y — } Alwaye/Cochin (Machine Tools, Fertilisers, Chemicals)
Z — }

Map 16 **Coalfields and Industrial Centres**



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA
© GOVERNMENT OF INDIA COPYRIGHT, 1964.

to tables X-XII. Here, again, the concentration is around the large urban centres; five centres (Bangalore, Bombay, Calcutta, Delhi and Madras) claim a very large share of these industries. All these industries produce, annually, products worth about 3 billion (3,000 million) rupees.

The following are the important centres and the nature of their specialization in engineering industries:

1. *Ahmedabad* (Gujarat) — textile machinery;
2. *Bangalore* (Mysore) — aircraft; machine tools; telecommunication and electronics; railway coaches;
3. *Baroda* (Gujarat) — textile machinery;
4. *Bhopal* (M.P.) — heavy electricals (Government of India Project with British assistance);
5. *Bombay* (Maharashtra) — textile machinery; automobiles, components and assembling (collaboration Fiat, Italy); shipbuilding; precision instruments; electrical goods; small machinery;
6. *Calcutta* (West Bengal) — automobiles, components and assembling (collaboration, Morris Motors, Britain); electricals; precision instruments; textile machinery;
7. *Chittaranjan* (West Bengal) — steam locomotives; electrical locomotives; (all Broad gauge);
8. *Delhi* — electrical and small machinery;
9. *Jamshedpur* (Bihar) — steam locomotives (metre gauge); diesal trucks, components and assembling (collaboration Mercedes Benz, West Germany);
10. *Kanpur* (U.P.) — defence equipment;
11. *Madras* (Madras) — automobiles, components and assembling (collaboration, Standard Motors, Britain); Trucks, components and assembling (collaboration Leyland, Britain); Motor-Cycle (collaboration Royal Enfield) railway coaches (Broad gauge); bicycles; diesel engines; electricals; small machinery; surgical instruments;
12. *Mysore* (Mysore) — motor cycles, components and assembling (collaboration Czechoslovakia)

13. *Nahan* (Himachal Pradesh) — agricultural implements; electric motors; iron saddles, anchors, etc; (for the Post and Telegraph department);
14. *Pinjore* (The Punjab) — machine tools;
15. *Poona* (Maharashtra) — diesel engines and pumps; automobiles (jeeps) components and assembling; machine tools; electricals; some defence equipment;
16. *Ranchi* (Bihar) — heavy engineering (Government of India Project).
17. *Rupnarainpur* (West Bengal) — cables and wires (main supplier to the Post and Telegraph department);
18. *Secunderabad* (Andhra Pradesh) — tools; some defence equipment;
19. *Tiruchirappalli* (Madras) — boilers; railway equipment;
20. *Visakapatnam* (Andhra) — ship building.

Most of these engineering industries have been developed with aid from Britain, West Germany, Soviet Union and Czechoslovakia; the first two have played a dominant part in the development of these industries.

CHEMICALS AND DRUGS INDUSTRIES

The two world wars made India realise the importance of producing some of the essential chemicals and drugs within the country; nitrogenous fertilizers, caustic soda, soda ash, sulphuric acid, ammonium phosphate and calcium carbide are some of the important chemicals that are being produced in increasing quantities. The need for producing important drugs like pencillin. streptomycin, sulpha drugs, aspirin, Vitamin B 12 and C is also being increasingly appreciated within the country. Dyes and insecticides are other important requirements that can be supplied by this industry.

The following are the important centres and their specialization in production.

1. *Alwaye* (Kerala) — D.D.T.
2. *Baroda* (Gujarat) — pharmaceuticals,

3. *Bombay* (Maharashtra) — pharmaceuticals,
4. *Calcutta* (W. Bengal) — pharmaceuticals,
5. *Delhi* — D.D.T.
6. *Mettur* (Madras) — basic chemicals,
7. *Poona* (Maharashtra) — antibiotics,
8. *Sindri* (Bihar)—basic chemicals.

FERTILIZER INDUSTRY

For a country like India, where the pressure of population on agricultural lands is increasing day by day, fertilizers appear to be magic-wands; everywhere optimistic estimates of crop yields for the following year are made; these are based on expectations from the fertilizers to be used on the lands under consideration. Fertilizers, however, are only one of the many steps to be adopted for achieving self-sufficiency in food for the country.[1] About 850 million rupees have been invested in the various fertilizer factories built up within the last two decades. The larger establishments are mostly state managed ones.

Alwaye (Kerala), Ennore (Madras), Nangal (The Punjab), Neyveli (Madras), Rourkela (Orissa), Sindri (Bihar) and Trombay (Maharashtra) are the important centres. The fertilizers produced are generally ammonium sulphates, nitrogen, ammonium phosphates and super phosphates.

CEMENT INDUSTRY

Cement has become an essential building material; residential buildings, factory buildings, dams, highways and bridges all demand increasing quantities of cement. The occurrence of limestone over a wide area in the country has made possible the development of the industry in most states. 36 centres, in 12 states, produce around 10 million tons of cement every year.

---

[1] Drastic checks on the growth of population is the most important step to be adopted; all other steps would fail if population growth continues at the present pace. Other important steps would be selection of seeds, better managements of land, better prices to the cultivator for the crops, and improved organization for procurement and distribution of the food crops.

Within the last two decades cement production has increased seven-fold; increase in consumption has been equally fast. Bihar, Punjab, Andhra Pradesh, Madras, Madhya Pradesh, Gujarat and Mysore are the important states in the production of this valuable material.

SUGAR INDUSTRY

Climate and availability of cheap labour have been helpful in the development of sugar industry in this country. Large areas in Uttar Pradesh, Bihar, Punjab, Maharashtra, Mysore and Madras grow sugar cane. About 180 factories produce roughly 3 million tons of sugar; this quantity of sugar is produced from less than a third of the cane grown in the country; about 2/5 of the cane is used up in the making of gur (crude sugar) at a large number of rural centres, where crude crushers extract the juice before it is boiled into concentrates. In general the organised industry is more efficient and productive in the four peninsular states of Maharashtra, Mysore, Madras and Andhra Pradesh; though Uttar Pradesh and Bihar have a very large number of mills the productivity has not been very satisfactory. Exports of sugar, though restricted by international understanding, earn for the country valuable foreign exchange. The internal demand has been increasing steadily. Production of refined sugar must be increased to meet all the internal demand and allow a surplus for export to hard-currency areas.

THE PAPER INDUSTRY

Since the Second World War this industry has been growing steadily. The following figures indicate the nature of progress :

	1950 (in tons)	1962 (in tons)
1. Straw-boards	22,000	2,800
2. Paper and paper-board	109,000	383,000
3. Newsprint	—	25,300

There are 26 paper mills in the country and 20 straw-board factories. The production is not adequate to meet the demand within the country ; the country has to import 32-40 thousand tons of paper from countries of North-Western Europe, Canada, the U.S. and Japan. An organised, and well-planned, effort might increase the production considerably; the factors that could check the expansion are the availability of pulp and plentiful supply of soft water; it is doubtful whether the steadily increasing demand would ever be met by internal production.[1]

OTHER INDUSTRIES

There are many other industries that are essential for the day to day life of the people; these are found scattered all over the country; matches, vegetable oils and toilet articles are some of the products of these industries. Many of these can be considered as part of the small-scale industries; some of them can be described as cottage industries. It is not possible to consider these industries individually in a book of this size. However, it may be mentioned that these industries feed (*a*) other industries by providing components for them (*b*) the people directly with consumer needs.

These small-scale and cottage industries have a very important place in Indian economy; their value lies in the fact that they provide employment to a very large number of persons (32-35 million), cater to regional needs and tend to keep prices at moderate levels.

Since they utilize regional skills some of their products are of a high quality. The Government of India and the State Governments have tried to help these industries by offering them space and amenities (power, water etc.) in "industrial estates"; these estates are located near the larger cities. By the middle of 1963 about 85 such industrial estates were functioning. The Central and State Governments are also helping these industries to market

---

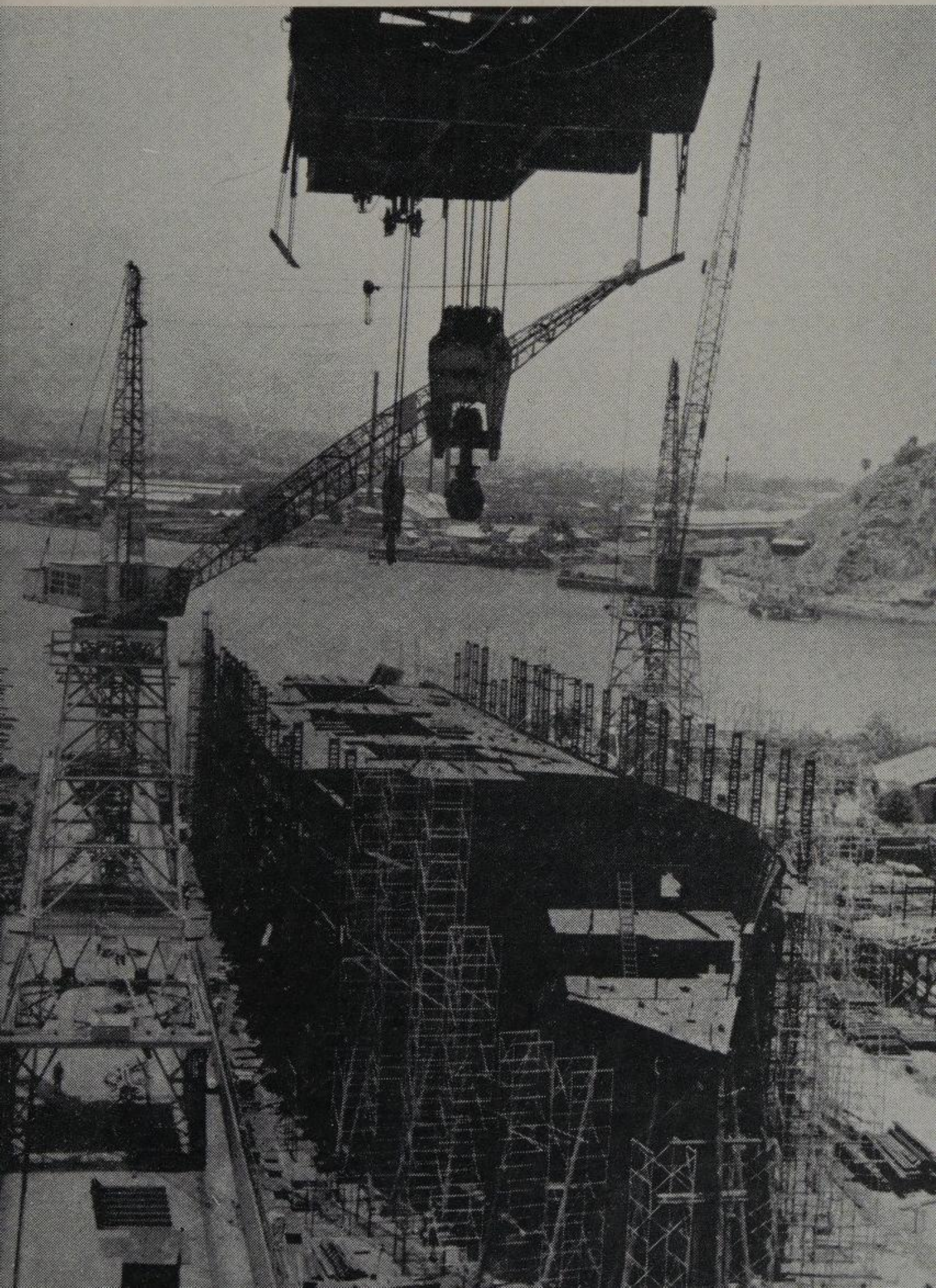
[1] When the country needs more land for cereals, millets, pulses, fodder-grasses, tea, cotton, sugar-cane and rubber, increasing the area under pulp-yielding trees, bamboos and grasses is possible only to a limited extent.

their products at home and abroad. Some of the products have earned for themselves an All-India and, even, International market[1].

[1] A handloom fabric from the Madras State has been popular in the U.S.A. or some years now; it is known as "bleeding Madras" since the colour tends to run as the fabric is washed!

Plate 19. SHIPBUILDING INDUSTRY — VISAKAPATNAM

(*see page 88*)



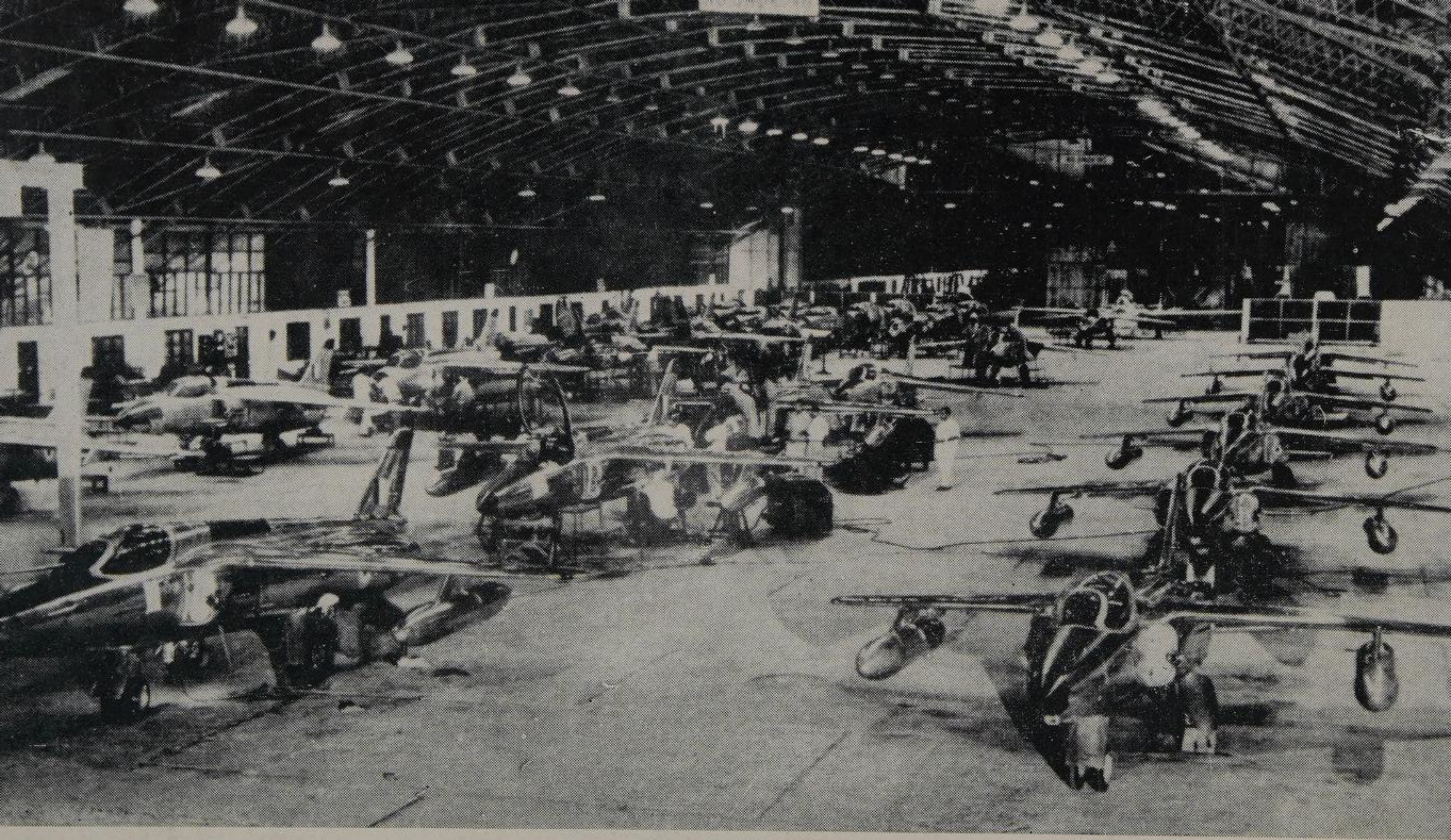


Plate 20. AIRCRAFT INDUSTRY — BANGALORE

(*see page 88*)

CHAPTER IX

TRANSPORTATION AND COMMUNICATION

In a country of the size of India the need for transportation and communication facilities is very great. In times of regional famines or other calamities the need for such facilities is even greater. Fortunately there are not many geographic obstructions to the development of such facilities; as a matter of fact over a large part of the territory conditions are quite favourable. Surface configuration and climate are, in general, unobstructive. The Himalaya Mountains are the only large tract of land which make efforts in this direction quite difficult. Climatically, the very wet areas of Kerala and Assam pose some problems for erection and maintenance.

By 1947 (when India gained her political independence) the country had a reasonably good network of railways and somewhat inferior network of roads.[1] Inland waterways were confined mainly to the Ganga-Brahmaputra rivers and the Buckingham Canal along the east coast; by 1947 there were about 5000 kms. of such navigable waterways. Civil Aviation had just started with only very large cities being inter-connected. From such a situation the development over the next decade was encouraging; an idea of the overall development can be gained by studying the following table :

	1947-48	1957-58
Railway route kms.	55,000	56,600
Roads metalled kms.	160,000	165,000[2]
Inland Waterways kms.	5,000	5,500
Civil Aviation kms. flown	15,500,000	42,000,000

[1] 55000 kms. of railway and 160000 kms. of metalled roads for the whole pre-partition area.

[2] Including 23300 kms. of national highways.

There has been further development since 1958-59 in all these major means of transportation of commodity and people. The four major avenues of transportation may be considered separately.

RAILWAYS

During the century preceding the year of achievement of sovereignty the British India Government had invited British interests to undertake development of railways in India; some of the rulers (Rajas and Maharajas) of the semi-independent Indian States also joined the British India Government and invited British interests to construct railways within their states.[1]

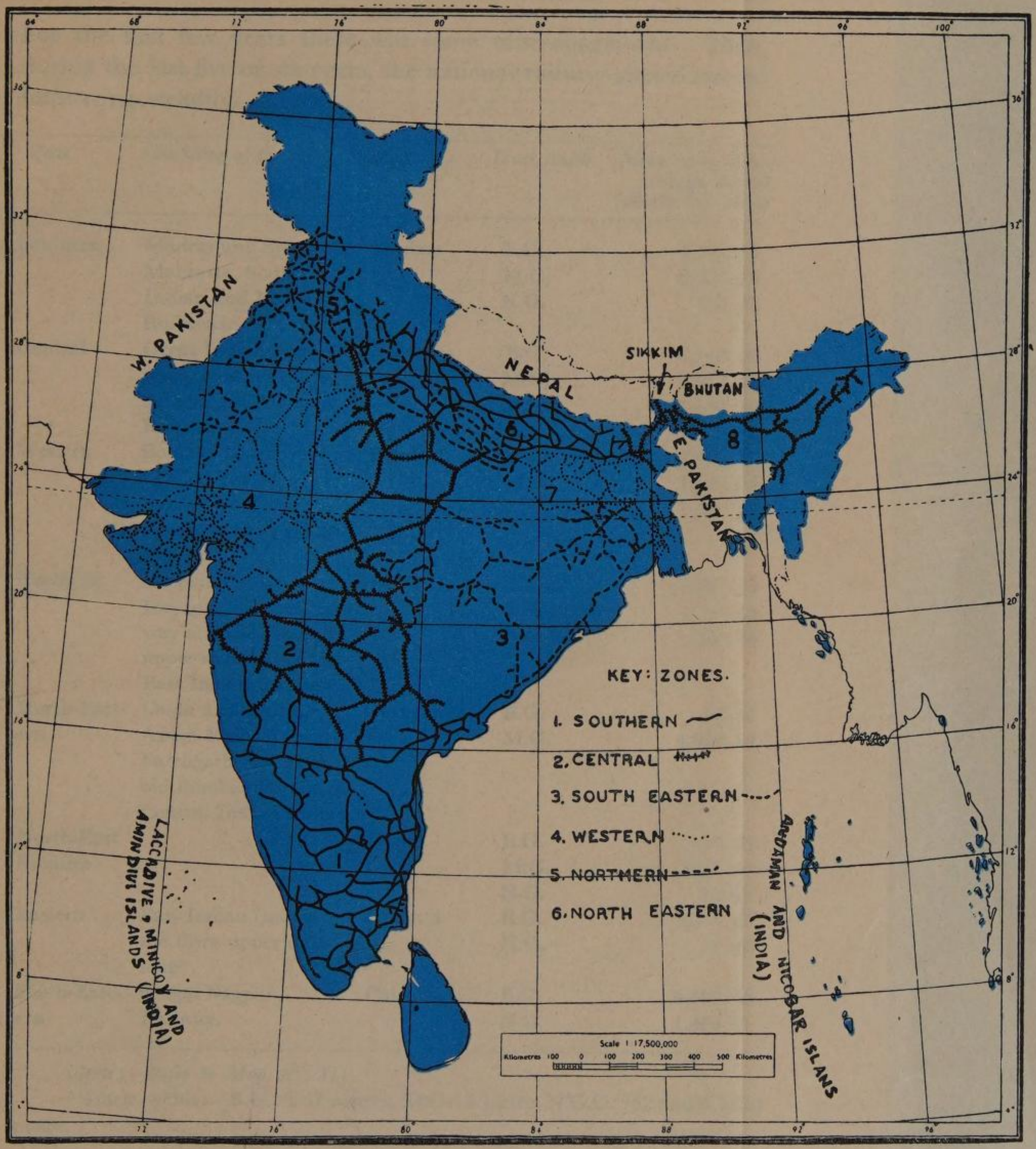
During the period 1853-1947 about 37 railway systems had developed in the country; of these, seven large ones operated in the British Indian provinces. These railway systems lacked uniformity in every respect—track-gauges, track quality, operating staff for areas covered and so on. The seven large ones that operated in British India were essentially oriented towards the port cities of Bombay, Calcutta and Madras; commodities for export (mainly to Britain) were given special freight concessions as they were transported by these railways to the port cities.

After 1947, the new India, reduced in size, but an independent sovereign power, took over all the railway systems under state management. The considerable credit built up in Britain during the Second World War was utilized for purchasing all the railway systems. The Government of India, through the Ministry of Railways, undertook rationalization in a big way—the large number of systems that had come into existence before 1947 were organized into eight Zonal systems (as indicated in table); some of the narrow gauge tracks were converted into metre gauge ones; different classes of travel, with associated amenities, were introduced, withdrawn, changed, modified and, in general, played with.

---

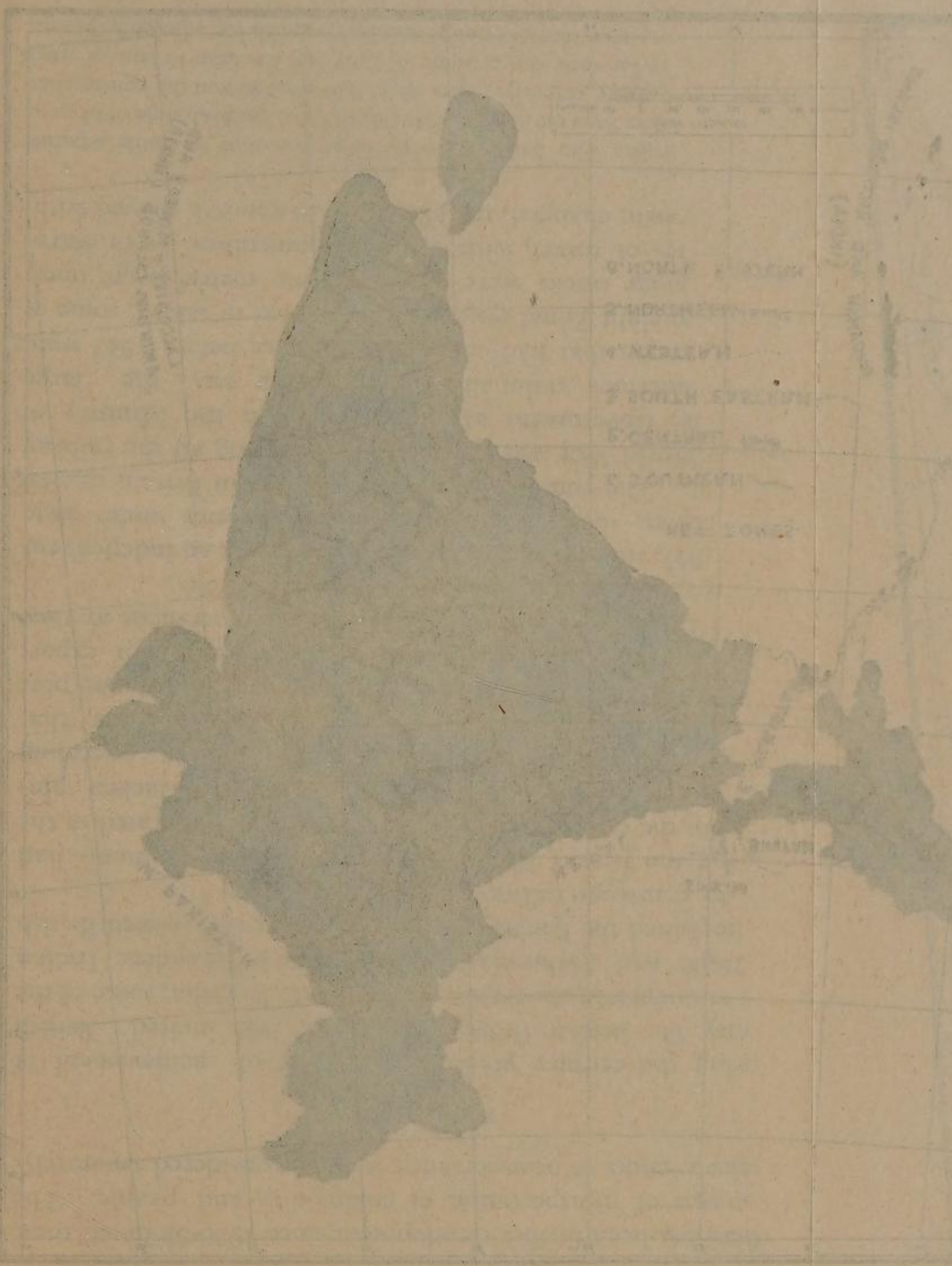
[1] The only rulers who had sufficiently large territories to justify separate railways for their states were the Nizam of Hyderabad and the Maharaja of Mysore. Actually, however, many princely rulers spent fabulous sums on the construction of separate railways for their states; some of these had less than 15 kms. of track and had a narrow guage that did not permit linking with the adjoining systems.

Map 17 Railways



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.



For the first few years there was some mismanagement. Then, during the last five or six years, the national railway system started improving steadily.

Zone	*Consisting of the old*	*Headquarters*	*Track width*	*Mean route Kilometrage worked (March 31, 1963)*
Southern	Madras and Southern Mahratta, South Indian and Mysore Railways.	Madras	B.G.	3,153.58
			M.G.	6,669.23
			N.G.	154.01
Central	Great Indian Peninsular, Nizam's State, Scindia and Dholpur Railways	Bombay	B.G.	6,148.99
			M.G.	1,545.53
			N.G.	1,166.74
Western	Bombay Baroda & Central India, Saurashtra, Kutch Rajasthan and Jaipur Railways.	Bombay	B.G.	2,855.36
			M.G.	5,985.64
			N.G.	1,222.74
Northern	Eastern Punjab, Jodhpur, Bikaner Railway and the three upper divisions of the East Indian Railways.	Delhi	B.G.	6,807.44
			M.G.	3,296.63
			N.G.	260.44
North-Eastern	Oudh and Tirhut, Assam Railways and Fatehgarh district of old Bombay Baroda & Central India Railway.	Gorakhpur	B.G.	52.47
			M.G.	4,914.83
North-East Frontier		Pandu	B.G.	177.99
			M.G.	2645.44
			N.G.	83.63
Eastern	East Indian (minus the three upper divisions)	Calcutta	B.G.	3,915.63
			N.G.	27.58
South-Eastern	Bengal Nagpur Railway.	Calcutta	B.G.	4,591.52
			N.G.	1,404.61

(*Note*: *Refer to Map No. 17*)

[1] Track width: B.G. 1.67 metres; M.G. 1 metre; N.G.C. 762 and 0.7610 metre.

The nationalised railway system is very essential to the people of the country; it carries about 1.8 billion (1,800 million) people every year; it is essential for the transportation of coal, metallic ores, food grains and many other commodities that support the industries and commerce of the country.

Industries feeding the railway system have started yielding results.[1] Income has been steadily increasing with the increase in number of passengers and freight; annual income from passenger traffic is about 1.75 billion (1,750 million) rupees, while income from freight amounts to about 3.4 billion (3,400 million) rupees.

PASSENGER TRAFFIC AND EARNINGS

	1960-61	*1961-62*	*1962-63*
Number of passenger (in hundreds)	161,38,86,2	171,23,70,0	177,03,04,0
A.C.	1,44,4	1,58,0	1,83,0
First Class	3,46,00,1	4,11,47,0	4,61,17,0
Second Class	1,11,36,9	1,11,12,0	1,10,14,0
Third Class	156,80,04,8	165,99,53,0	171,29,90,0
Passenger Km. (in thousands)	7,806,06,58	8,228,39,79	8,449,77,07
A.C.	10,99,85	11,65,86	13,04,38
First Class	193,29,67	211,23,32	228,97,77
Second Class	179,87,12	181,05,21	183,40,25
Third Class	7,421,89,94	7,824,45,40	8,024,34,67
Earnings from passengers (in thousand rupees)	132,51,76	151,80,21	170,17,62
A.C.	1,18,08	1,38,15	1,61,42
First Class	8,33,72	9,81,59	11,79,42
Second Class	5,74,21	6,36,64	6,97,26
Third Class	118,33,98	134,55,44	149,79,31

While there has been improvement in the management of the railways by the state, there has been steady deterioration in the

[1] India has become self-sufficient in the production of steam-locomotives, passenger cars, and goods wagons. Production of diesel and electric locomotives has begun at Varanasi and Chittaranjan respectively; rails, fish-plates, signalling equipment are all made within the country.

behaviour of the public for whom the railways are being operated. To gain the attention of the Government to any regional, political problem, it has become the practice of groups of individuals to disrupt railway movement;[1] damage to the railway property has been increasing year by year; if the Minister of Railways is not popular with the troublesome groups, an appeal for his removal from office can be created by causing a number of railway accidents.[2]

The main defects of the Indian Railways are the following (*a*) lack of speed (*b*) too many stops (*c*) over-crowding in the passenger trains (*d*) poor handling, and delay, at terminal points in the transportation of goods.[3] Many of the defects are due to poor maintenance of tracks, insufficient number of passenger trains and dependence on steam-locomotives for which coal has to be transported over considerable distances. Unless new tracks, with heavier rails, are laid higher speeds would not be possible. Introduction of electric and diesel locomotives would help very much in improving the performance of the system.

A very satisfactory aspect of the whole system is the self-sufficiency the country has achieved in the production of locomotives, cars, wagons, and many other requirements.

ROADWAYS

The country has had roads for many centuries; the quality of these has not changed much till recently. One finds that many of the roads that connect the rural settlements are still cart-tracks that have existed for centuries. Improvement started only near the large urban centres; even that came when motor-buses were introduced. Road development, therefore, is a feature of the recent decades.

---

[1] Attacking railway property is gaining ground over the more traditional method of undertaking a fast, with considerable publicity attached to it.

[2] The Minister for Railways is criticised in the Parliament and feels like giving up the post because some hooligans are irresponsible!

[3] Private operators using motor-lorries on the road are developing in many parts of the country; collection and delivery is at the door; some of these, like, the T.V.S. in Madras State, are known for their punctuality and efficiency.

The Government of India assumed responsibility for the construction and maintenance of the national highways in 1947. These are being developed to provide arterial routes across the country, connecting the big cities. By 1963 the country had over 24,000 kms. of national highways; these included the following routes :

NAT. H/WY. No. 1 DELHI—AMRITSAR

NAT. H/WY. No. 2 DELHI—CALCUTTA via Allahabad.

NAT. H/WY. No. 3 AGRA—BOMBAY via Indore and Nasik

NAT. H/WY. No. 4 BOMBAY—MADRAS via Poona, Hubli and Bangalore

NAT. H/WY. No. 5 MADRAS—DELHI via Vijayawada and Cuttack

NAT. H/WY. No. 6 CALCUTTA — BOMBAY via Nagpur

NAT. H/WY. No. 7 DELHI—CAPE COMORIN via Agra, Jabalpur, Nagpur, Hyderabad, Bangalore, Salem and Madurai.

NAT. H/WY. No. 8 DELHI—BOMBAY via Ajmer and Ahmedabad.

NAT. H/WY. No. 9 POONA—VIJAYAWADA via Sholapur and Hyderabad.

Besides these nine trunk routes the National Highways include 40 other connecting links; these are indicated in the map showing roads and air-routes. The distribution of the highways is shown below :

NATIONAL HIGHWAYS (STATE-WISE)

State/Territory	*Kilometres*	*Area of the State served by one kilometre of National Highway in it (in sq. kms.)*
Andhra Pradesh	2,350.3	119.0 (fair)
Assam	1,411	146.4 (fair)
Bihar	1,945	91.33 (very fair)
Gujarat	1,127	169.1 (poor)
Jammu & Kashmir	567.2	246.1 (very poor)
Kerala	433.3	91.16 (very fair)
Madhya Pradesh	2,781	162.0 (poor)
Madras	1,750	75.70 (good)
Maharashtra	2,478	126.1 (fair)
Mysore	1,360	143.6 (fair)
Orissa	1,420	111.5 (very fair)
Punjab	1,306	94.93 (very fair)
Rajasthan	1,303	266.8 (very poor)
Uttar Pradesh	2,425	123.3 (fair)
West Bengal	1,489	59.75 (good)

Each state has its own State Highways constructed and maintained by its Public Works Department. There are a little over 150,000 kms. of State Highways. These do not include cart-tracks and other seasonal routes.

There are many reasons for the unsatisfactory nature of the roadways in India. The roads are used by all types of vehicles—private automobiles, buses, trucks, bullock-carts and bicycles[1]—this affects the surface of the road as also the maintenance of speed. Secondly, most of the roads, including National Highways, are not sufficiently broad; usually the width ranges from 6 to 8 metres; as a consequence a lane for fast traffic, each way, is not possible. Thirdly, the routes do not avoid urban areas; instead they pass

[1] Apart from these vehicles these roads are used by shepherds and cowherds for guiding large herds of sheep and cattle from village to village; some times the road surface attracts rural folk to use it as drying ground for cereals and millets; sometimes poor people sleep on the road as the flooring in huts is poorer than the road surface and so also do the homeless.

through them; this is a nuisance both to the urban-dweller and the tourists travelling through the urban area by the highway. Still another difficulty is the fact that the highways tend to attract settlements, which, often, hug them.[1] Absence of motels (or even decent accommodation for nights), and other conveniences for tourists make conditions difficult for most tourists and general travellers.

From the administrative and co-ordinating points of view the Central and State Governments have set up a number of bodies (commission, council, committee, and so on) to develop roadways and traffic on them. These bodies should guide the development of roadways and appreciate private enterprises that are of value to the general public.

INLAND WATERWAYS

About 7200 kms. of inland waterways are open to navigation by small vessels; the important ones are:

> (*a*) the Ganga, Brahmaputra and their tributaries, (*b*) the Godavari and Krishna, and their canals, (*c*) the Buckingham Canal along the Madras-Andhra Pradesh Coast, (*d*) the backwaters and canals of Kerala and (*e*) the Mahanadi canals in Orissa. About a third of the total available waterway can be used by large mechanically-propelled vessels (over 100 tonnes); the rest of the waterways is mainly for smaller vessels.

A major difficulty in the development of inland waterways is the seasonal fluctuations of water in almost all the rivers of India—especially the Peninsular ones. Secondly, the demand for waterways is very limited; only some types of bulky commodities can be transported by these routes economically; the value of these routes

---

[1] Often one finds primary schools, small tea or coffee stalls and hutments quite close to the highway; the tourist, going by private car or by a regular bus, is warned to go slow in these zones; such zones are numerous and, consequently, speed is not possible.

is largely limited to the ribbons of territory they can serve.[1] Passengers might travel in greater numbers over selected stretches (in Assam, East Coast and West Coast) if proper publicity to the beauty of the stretches is given and good vessels are provided. A good income is possible from tourists if this aspect is further developed.

SEAWAYS

With half the country projecting southwards into the Indian Ocean, India has ample scope for developing her overseas communications, including coastal traffic. A coastline of about 5,800 kilometres gives the country scope for considerable coastal traffic and overseas contact with foreign countries. Though natural harbours are not many, the ones that have been developed (including artificial ones) are well-spaced along the peninsular coasts; on the West coast are Khandla, Bombay, Marmagao and Cochin; on the East Coast Madras, Visakhapatnam and Calcutta are the important ones.

During the past two decades development of shipping has been quite impressive; starting with old vessels, purchased from other countries, the tempo of expansion has increased in recent years. About the end of 1963, over 1.2 million gross tons were registered; a quarter of this tonnage was largely for coastal traffic; the rest served India's trade and communications with foreign countries. The Government-owned shipyard at Visakhapatnam has, so far, built 38 ships of an aggregate tonnage of 180,000. Cochin is also being developed into a ship building port.

The Shipping Corporation of India has about 30 vessels and operates cargo traffic to Australia, Far East, U.K. and Europe and the U.S.A., It also operates passenger-cum-cargo vessels between Bombay and East Africa and Madras and Singapore. Besides this Government-managed line, there are over two dozen smaller private operators (with a total tonnage of about 900,000)

---

[1] Fire-wood, structural timber, coal and the like are transported on the Ganga Brahmaputra rivers between the areas of production and consumption, each of which is close to the rivers.

engaged in overseas and coastal trade. Considerable amount of the country's foreign trade is still carried by foreign carriers.

A major problem in coastal shipping is the periodic stoppage of all traffic necessitated by the monsoons. For 3—4 months every year coastal traffic has to be stopped because of the very rough seas. Another difficulty is the limited storage facility at all the ports. The ports are, however, being improved and enlarged. The expansion of Cochin and Madras ports is already half-way through. Mangalore and Tuticorin are to be developed as major ports.

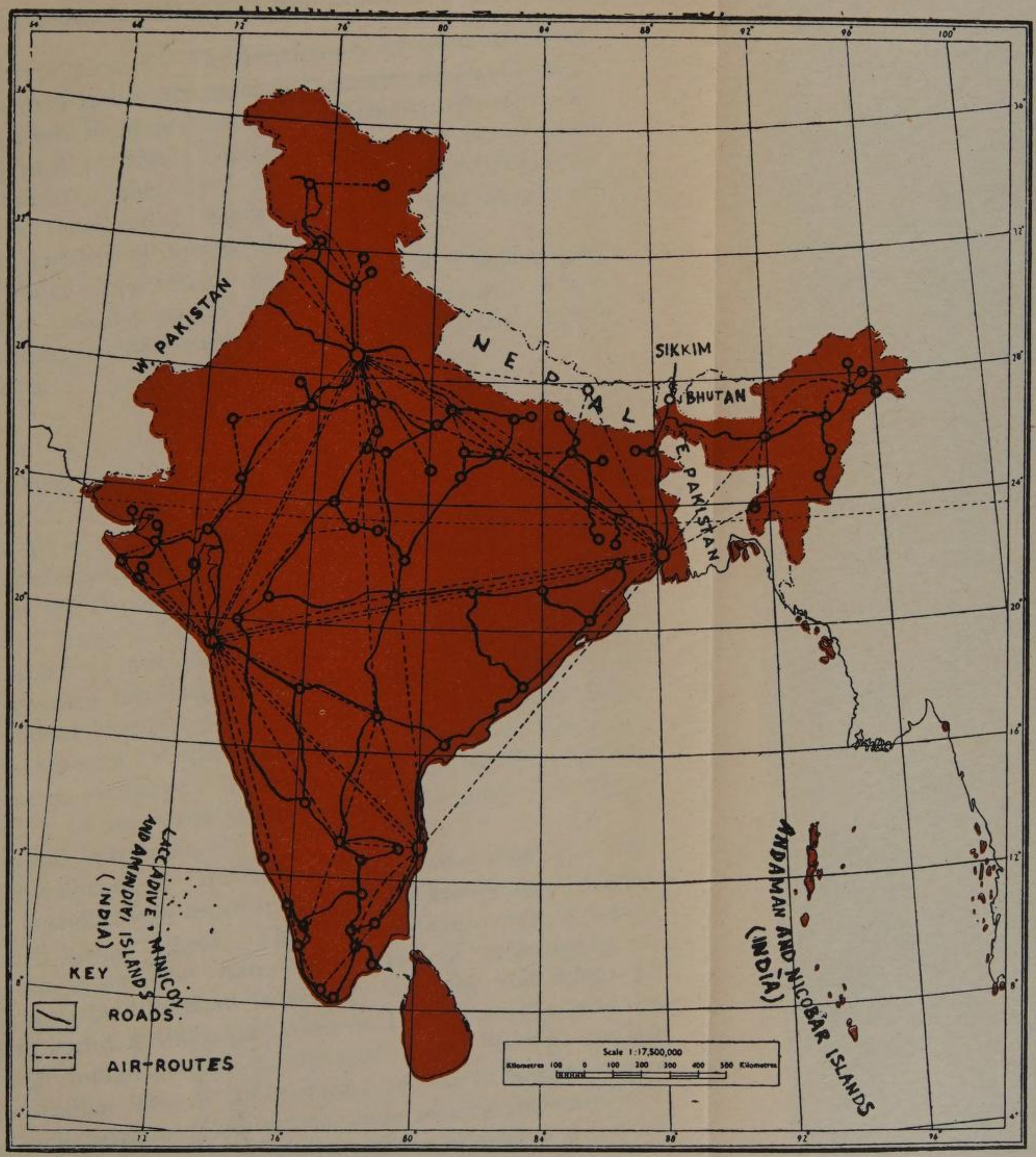
CIVIL AVIATION

It is in the development of aviation that the progress in the country has been remarkable. The extent of the country, and the favourable climatic condition, are helpful factors. The fastest railway train takes 23 hours to travel between Bombay and Delhi; the Boeing 707 connects the two cities in a flying time of eighty minutes—All the major cities are connected by scheduled jet services; Boeings and Caravelles are used to connect these cities. The nature of the progress of civil aviation is indicated below:

Year	*Kms. flown (Millions)*	*Passengers carried (Millions)*	*Freight including mail (Millions kgms.)*
1947	15.0	0.25	3.2
1951	31.4	0.45	42.9
1956	37.8	0.56	48.4
1961	44.4	0.97	47.5
1962	45.2	1.03	45.8
1963	53.5	1.23	76.8

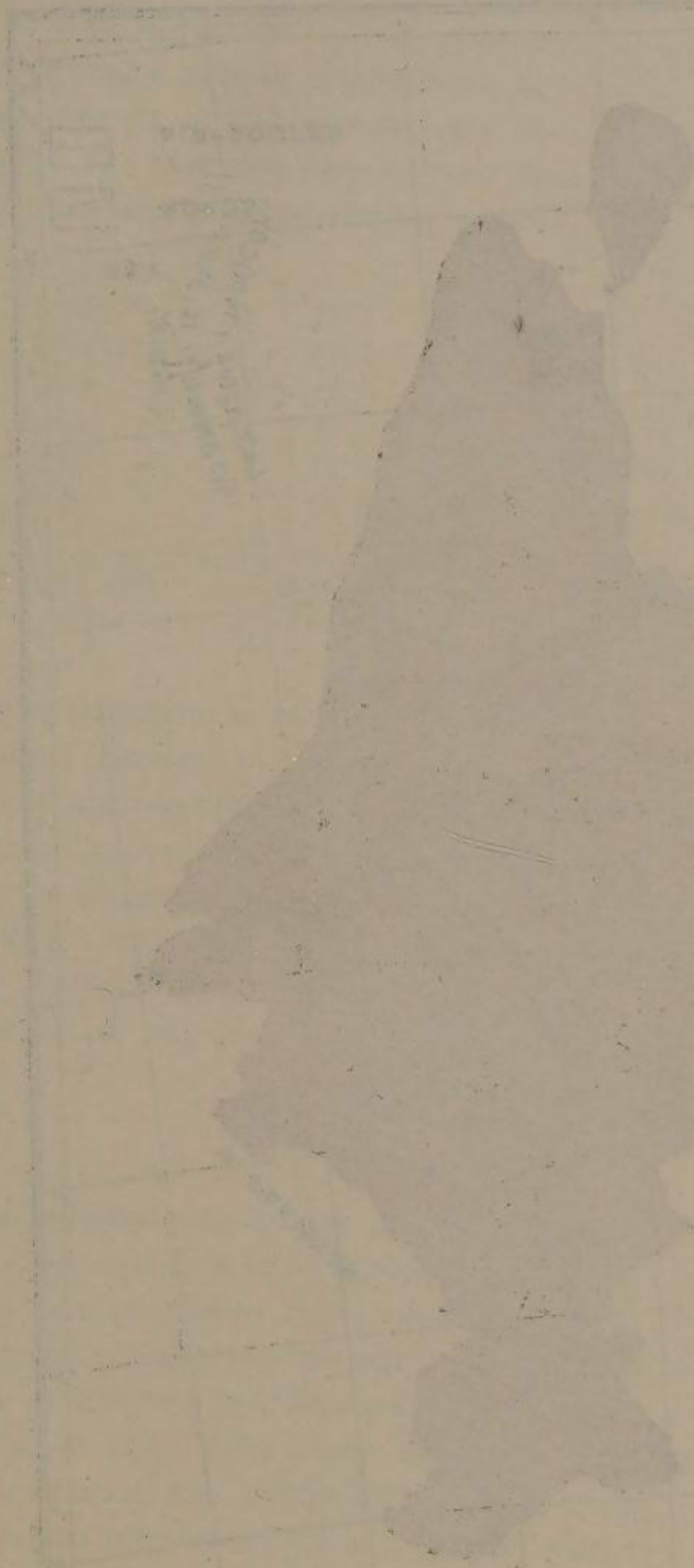
The Government controlled Indian Airlines Corporation is in charge of the Civil Aviation within the country. It operates a fleet of 70 planes; 5 of these are Caravelle Jets; 12 are Viscount Turbojets; the others include Skymasters, Fokker Friendships and Dakotas. The I.A.C. has also been operating Boeing 707s, borrowed from Air India Corporation, for flights between Bombay-

Map 18 India—Trunk Roads and Air Routes



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.



Delhi and Bombay-Calcutta. The Department of Civil Aviation, of the Government of India, maintains and operates 82 aerodromes; of these the airports of Bombay (Santa Cruz), Calcutta (Dum Dum), Delhi (Palam) and Madras (Meenambakum) are major ones serving international flights also. The airports of Ahmedabad, Agra, Bangalore, Hyderabad, Madurai, Nagpur and Patna are very important junctions of internal air routes.

The Air India Corporation, with a fleet of 7 Boeing jets, provides services reaching out to more than 20 countries. Many of these countries, in their turn, operate through India's international airports.

TOURISM

A Department of Tourism has been set up by the Ministry of Transport with a chain of regional offices in important cities like Bombay, Calcutta, Delhi and Madras; smaller information offices have been developed at a number of other regional centres. Outside India the Department has offices operating in New York, San Francisco, Toronto, London, Paris, Frankfurt and Melbourne.

The number of foreign tourists coming to India for travel within the country has been steadily increasing; in recent years it has been about 150,000 per year. Foreign tourists, especially from Anglo-America, Western Europe and Australia, bring in valuable foreign exchange. Publicity abroad and facilities within India need to be improved considerably; then only, very large numbers would visit India.

Publicity abroad is inadequate because the staff have not themselves travelled very much in India; their knowledge of India, even through books, is poor. They do not have, ready at hand, specific plans to suit the tastes and purses of individuals; an American may be interested in seeing wild life and might be prepared to spend $ 100 a day while in India; another may be interested in Indian classical music and might have a smaller purse; the Indian Tourist Office should be able to suggest itineraries for such persons. Courtesy to those seeking information is very important. The Indian Tourist Office abroad is there not

only for foreigners but also for Indian travellers. This is an aspect that has been, too often, ignored.

Tour plans, routes, probable expenses, information regarding facilities, etc. are required for both foreign and Indian travellers. Some attractions of India have not been fully exploited, while others have been completely spoilt. Assam's wild-life sanctuary, with a steamer-trip up the Brahmaputra, would be very interesting and could draw a very large number of tourists. At the other extreme, the natural beauty of Kanyakumari has been partially lost by some modern constructions.

The Government of India must realise that tourism could bring in very large revenue into this country. The following major steps need to be taken (*a*) Members of the staff of Tourist Offices should have themselves travelled in India considerably; they must have imagination and tact (*b*) Areas attractive to tourists must be preserved; old names, old surroundings and even old buildings should remain untouched. Permitting the development of a settlement in the area, allowing hotels of different sizes and qualities to cluster around the core of the area, building monuments that do not merge with the landscape, these are some of the sure steps to destroy the attractiveness of the area. These areas should be protected from the nuisance of beggars and unlicensed guides (*c*) Separate pamphlets giving information about each of these areas should be prepared and be made available to the tourists. Plans that include a number of interesting places in 'route-tours' should be available to tourists; for example one 'route-tour' could include Agra-Delhi-Chandigarh-Simla; another could include Tiruchirapalli-Madurai-Periyar Lake (game sanctuary) etc.

POSTAL AND OTHER COMMUNICATIONS

Like the Indian Railway, the P. & T. Department is a major Government of India undertaking; it employs about half a million persons and works as a commercial-cum-utility service. Part of the income is made over to the general revenue of the country. Postal revenue, for recent years, has been around 500 million rupees a year; the number of permanent post offices is a little

over 55,000; in addition there are about 32,000 temporary ones, mostly in rural areas. The post offices also function as savings banks for small savings.

Over 12,000 telegraph offices operate in the country; about 1.9 million kilometres of overhead wires provide the connections between all these stations. The revenue is around 120 million rupees per year.

Telephone services have increased rapidly in recent years. The number of connections has increased to about 0.70 million; revenue from this is around 350 million rupees annually. The Indian Telephone Industries at Bangalore has helped the growth of the telephone services in the country to a great extent.

In addition to the above communication services the Government of India operates overseas communications with radio-telephone, radio-telegraph, radio-photo and International Telex services.

CHAPTER X

A DEPENDENT PEOPLE

VERY FEW COUNTRIES in the world can, if it comes to that, remain comfortably self-sufficient. India is certainly not one of them. An already large population (about 450 million) is growing at a terrific pace; every year 8 to 9 millions are being added to the total population. As against this, food production has been decreasing in recent years.[1] Variations from the normal could be positive or negative as far as food production is concerned; but population has no negative variation. Failure of the Monsoon affects only food production; population growth is unaffected; starved mouths bring in more mouths to face starvation. Independent India, in nearly two decades of its existence, has not tackled the most important problem with vision and firmness.[2] Literacy is still very poor. Education must precede all other efforts to improve the lot of the people. Then only democracy would be real and unshakeable.

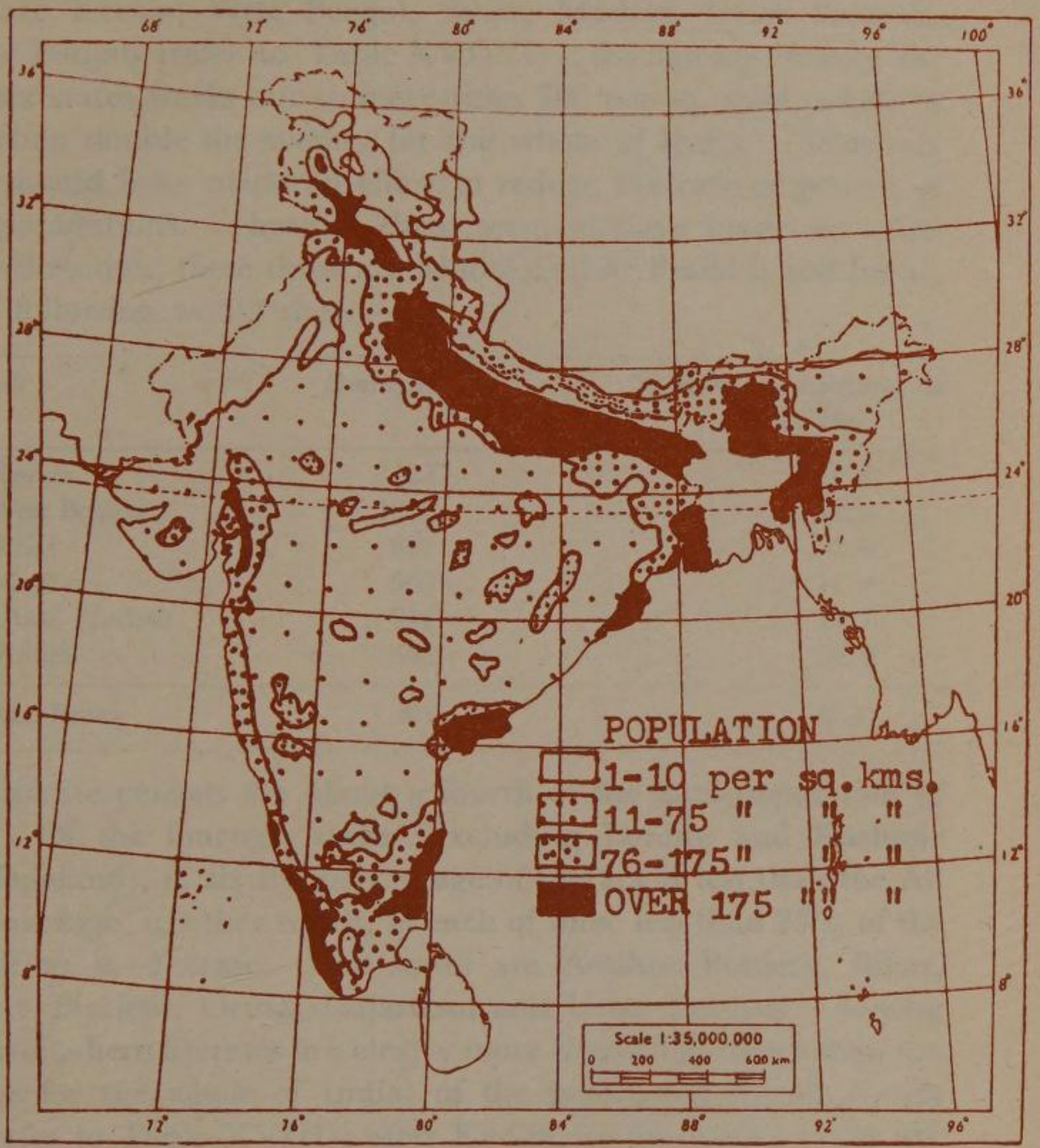
During the six decades since 1901 birth rate has, fortunately, decreased from 51 per thousand to about 40 per thousand [refer to Table XVII (b)]; during this period, however, death rate has also decreased from 43 per thousand to 18 per thousand. As a result of the greater fall in death rate the effective addition to the population is higher. At the other end, the expectation of life at birth has improved from 23 in 1901 to 45 in 1966; this also adds to increasing pressure of population on land and its resources. While the density of population of the whole India is about 370

---

[1] It is estimated that there is likely to be a 14 million ton shortfall in food production for the 65-66 year as compared to the previous year.

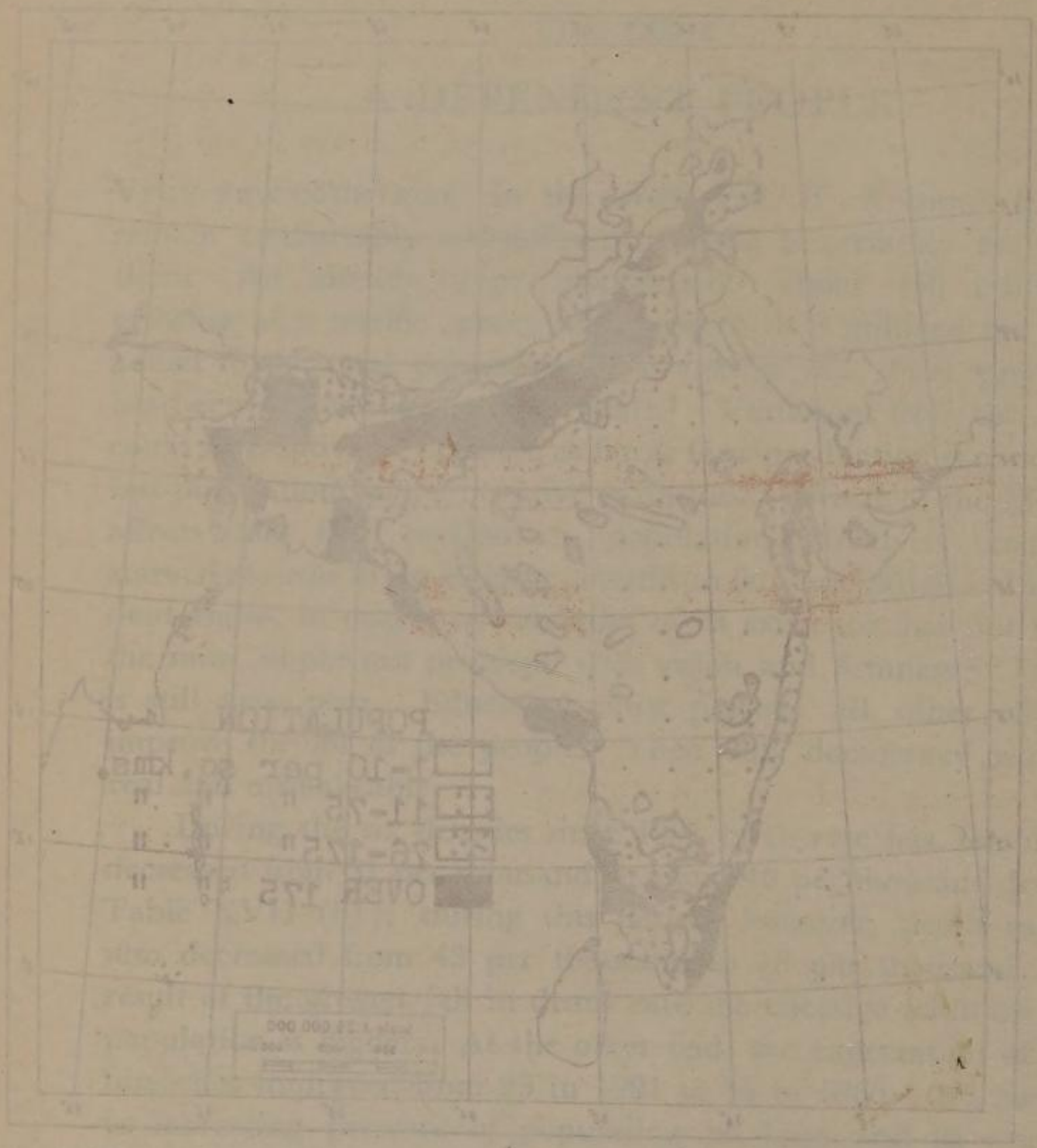
[2] During the same period Japan has successfully checked the growth of its population. It is unfortunate that India has been interested only in the Japanese method of paddy-cultivation; the country would have been better served if the Japanese method of checking population growth had also been adopted simultaneously.

Map 19 India — Density of Population



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA

© GOVERNMENT OF INDIA COPYRIGHT, 1964.



per sq. mile, six states have actually much higher density each; these are Kerala, West Bengal, Bihar, Madras, Uttar Pradesh, and the Punjab [refer to Table XVII (*a*)]; the average density for these six states works out to more than 760 per sq. mile, which is more than double the average for the whole of India.[1] These six states should have made an effort to reduce the rate of growth of their populations. Three of them seem to have made an effort in this direction; these three are Madras, Uttar Pradesh and Bihar, as the following would show :—

State	*Density/sq. mile*	*% increase in population for 1951-1961*
Kerala	1127	24.8
West Bengal	1032	32.8
Bihar	691	19.8
Madras	669	11.9
Uttar Pradesh	649	16.7
Punjab	431	25.9
ALL INDIA	*370*	*21.5*

Literate persons are about a fourth of the total population of India. Of the fourteen states (excluding Jammu and Kashmir and Nagaland), in six the percentage of literacy is less than the All India average; in other words, in each of these less than 25% of the population is—literate; these states are Andhra Pradesh, Bihar, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh. Among the states where literates are clearly more than 25% (more than the average for the whole of India) of the population Kerala stands first (refer to Table XVIII); after Kerala, in decreasing order are Madras, West Bengal, Maharashtra, Gujarat, Mysore, Assam and the Punjab.

Kerala and West Bengal figure among the three highest density states (the third being Bihar) and also among the three most literate states (the third being Madras). It is surprising to

[1] In the case of the Punjab and West Bengal refugees from Pakistan have added significantly to the densities of population there.

find these two states conspicuously absent among the top three ones that have shown a low increase in population for the latest decade, ending in 1961 census; in the case of West Bengal the influx of refugees explains partly the high increase during the decade; in the case of Kerala the percentage—increase of 24.8 [refer to Table XVII (*a*)] cannot be easily explained; actually this state has been experiencing considerable outward migration. The state with the highest literacy in the country appears to have made very little effort to check the rate of growth of its population. As a matter of fact the State of Madras appears to be the only State in the country that shows high literacy and low increase in population.[1]

During the 60 years since 1901 urban population has increased from 26 millions (1901) to 79 millions (1961); during the same period the number of urban centres has increased from 1910 to 2690. In other words while the number of centres has increased by only 40%, the urban—population has trebled itself during the same period (refer to Table XIX). This clearly suggests increasing urban pressure in many of the centres. A comparison of states with regard to urbanization shows Madras, Maharashtra and Gujarat to be the most urbanised states in the country (refer to Table XX). Each of these has more than a quarter of its population in urban areas. Madras and Maharashtra have the largest number of urban settlements. Actually, for its area, Madras has the largest number of non-rural (more than 5,000 population) settlements in the whole of India.

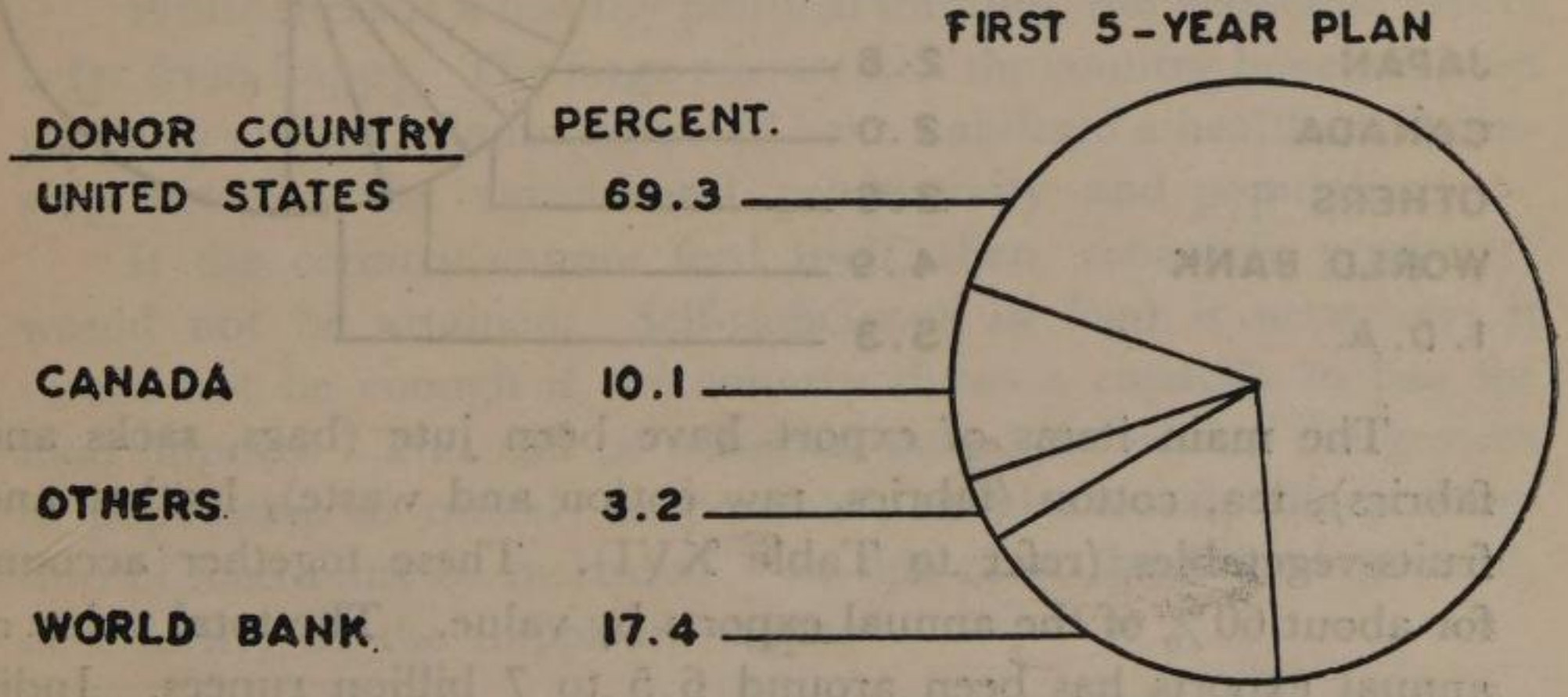
Internal migrations from rural to urban areas or from one state to another is a general feature of the whole country. As long as these migrations do not unduly upset the general balance and create problems of high pressure in some localities, these are healthy and desirable; they indicate the one-ness of India and help the development of a sense of integration among the people. These migrations are mainly for securing employment. From some

[1] It is true the State of Madras has also profited by considerable outward migration of its people; but the very low rate of increase must be largely due to efforts taken by a highly literate state.

areas of poor employment opportunities people migrate to urban areas which appear to offer much better opportunities of employment. Many of these are really disappointed and end up as small-retailers, shop-assistants, shoe-shiners, odd-job-men and beggars on the road. Cities like Bombay, Delhi, Bangalore, Madras and Hyderabad generally attract these migrants.

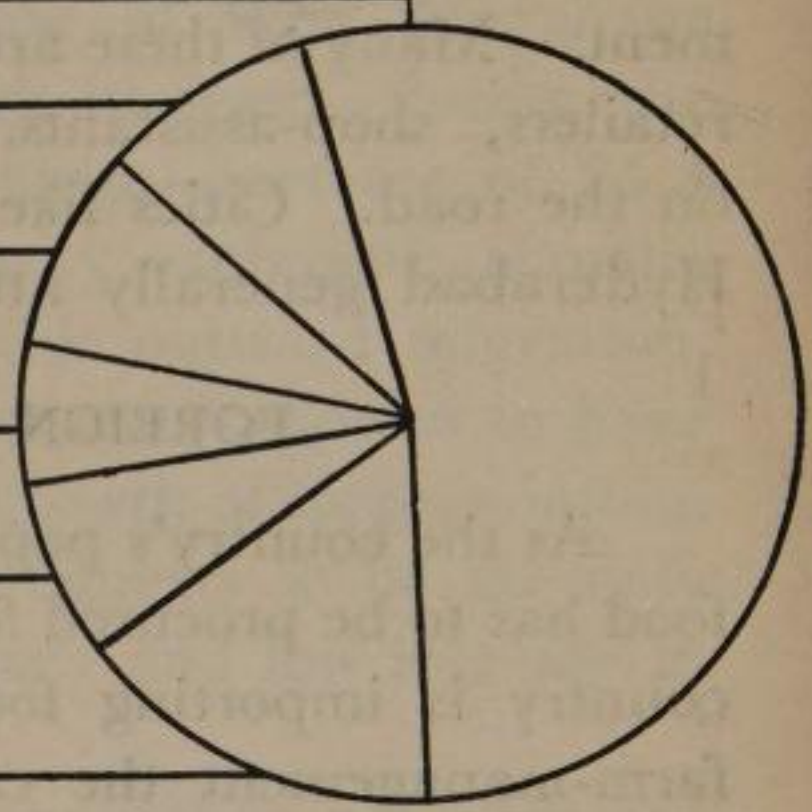
FOREIGN AID AND FOREIGN TRADE

As the country's population goes on increasing more and more food has to be procured for the increasing population. As it is, the country is importing food-grains every year. Even with better farm-management the capacity of this country to increase food production is much less than its capacity to increase population. Consequently, for a long time, imports of food items would continue. To pay for such items the country must be able to export other items (raw materials, finished products of industries, etc.). To be able to export, after meeting the large internal demands, the productive capacity must be increased considerably; to achieve this, for some years, foreign aid is necessary. The U.S.A., West Germany, Soviet Union and the U.K. have been the main helpers in this regard



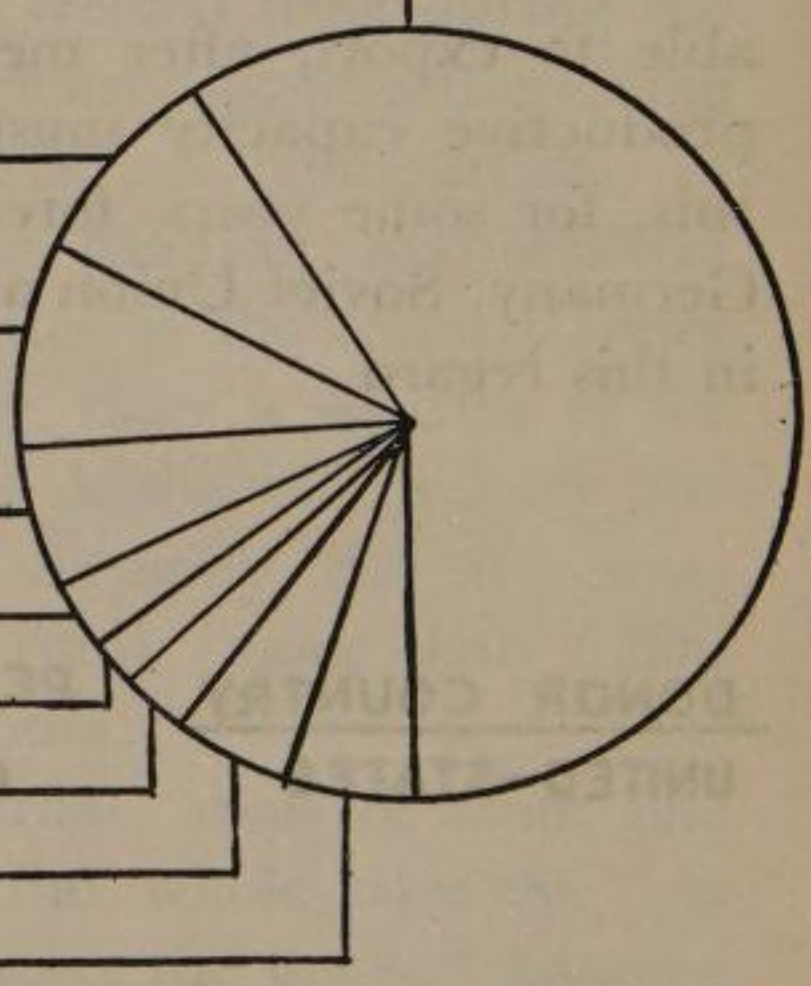
SECOND 5-YEAR PLAN

DONOR COUNTRY	PERCENT.
UNITED STATES	54.1
F. REP. OF GERMANY	8.9
UNITED KINGDOM	8.6
U. S. S. R.	5.4
OTHERS	7.2
WORLD BANK	15.8



FIRST FOUR YEARS OF THE THIRD 5-YEAR PLAN

DONOR COUNTRY	PERCENT
UNITED STATES	59.6
F. REP. OF GERMANY	8.4
U. S. S. R.	8.2
UNITED KINGDOM	6.2
JAPAN	2.8
CANADA	2.0
OTHERS	2.6
WORLD BANK	4.9
I. D. A.	5.3



The main items of export have been jute (bags, sacks and fabrics), tea, cotton (fabrics, raw cotton and waste), leather and fruits-vegetables (refer to Table XVI). These together account for about 60% of the annual exports by value. The total value of annual exports has been around 6.5 to 7 billion rupees. India must depend on these traditional items of export for many more years. These are the items that would continue to interest the

countries that are giving a large part of the foreign aid received by this country. Other items of export (see Table XVI) can be increased to a considerable extent with countries that are not so highly developed as the U.S.A., West Germany, U.K. and Japan.

The main items of import have been machinery, iron and steel, petroleum and products, and cereals. (Refer to Table XIV). These together account for about 50% of the annual imports; the annual imports are of the value of 11 billion rupees. It should be possible to reduce the imports by 20 to 25 percent. It is necessary to do so. The reduction could be achieved in the capital and intermediate goods (refer to Table XV); it may be difficult to reduce the imports of consumer goods.

AN OVERALL VIEW

The country is extensive; it is about six times the size of France in Europe. The population is overflowing; to continue the comparison, it is ten times as large as the population of France. The people speak fourteen major languages and practise (or believe in) four major religions. Over forty centuries of history has given "the people and the country" a complex political capability that is proving its worth among the sovereign powers that have emerged in this century.

While there is a healthy political stability, the economic aspect is far from happy. The large resources of the country have not been properly utilised; planning should have stabilized a healthy relationship between the agricultural productivity and population.

If the country cannot feed itself, then, economic prosperity would not be attained. Self-sufficiency in food is necessary; it would not be enough if the country shows a capacity to pay for food imports. This can be achieved only by checking the growth of population as quickly as possible[1]; simultaneously the production of food must be increased. In this effort the following could, necessarily, be the important steps:

[1] It would be very wise to adopt, in addition to an All-India policy on checking the growth of population, a concentrated effort to check the population growth in the two problem states of Kerala and West Bengal.

(*a*) Primary education for all children on a compulsory and free basis.

(*b*) Systematic propaganda, and publicity, for family planning.

(*c*) Provision of irrigation facilities and rural electrification; small and medium scale irrigation projects should get immediate attention; rural electrification should help education (evening classes, night schools, etc.) in the villages and pump-irrigation in the field. Provision of better techniques in agricultural production.

Next in importance would be the exploitation of those natural resources that would immediately yield good results. Small-scale and cottage industries producing quality goods for export should be encouraged; tourism must be properly developed.[1]

Third in the list of priorities should be improvement of settlements (both urban and rural ones); better housing, water-supply, drainage, electricity etc. are included in this.

Fourth in order of importance would be the big industries, which take too much money and time before yielding proportionately good results.

---

[1] This means better transportation and communication systems; better hotels and more hotels; showing more courtesy to the tourists at airports and railway terminals by the Indian Offices concerned and so on.

TABLES

TABLE I

AREA UNDER PRINCIPAL CROPS

(in thousand acres)

Crop	*1950-51*	*1955-56*	*1960-61**	*1961-62**	*1962-63***
1	2	3	4	5	6
Rice	7,61,35	7,78,91	8,29,47	8,46,50	8,59,61
Jowar	3,84,77	4,29,03	4,26,83	4,39,80	9,38,57
Bajra	2,22,96	2,80,18	2,82,30	2,73,22	2,64,70
Maize	78,07	91,32	1,07,74	1,11,03	1,13,16
Ragi	54,44	57,01	57,38	58,48	57,60
Small millets	1,13,80	1,31,84	1,21,01	1,17,84	1,15,73
Wheat	2,40,82	3,05,59	3,20,47	3,34,10	3,32,55
Barley	76,93	84,47	79,65	81,91	74,98
Total Cereals:	19,33,14	21,58,35	22,24,85	22,62,88	22,56,90
Gram	1,87,06	2,41,66	2,32,44	2,35,85	2,27,19
Tur	53,89	56,60	59,07	58,09	58,40
Other pulses	2,30,80	2,75,52	2,81,89	2,91,34	2,88,81
Total Foodgrains:	24,04,89	27,32,03	27,98,25	28,48,16	28,31,30
Potatoes	5,92	6,91	9,13	N.A.	N.A.
Sugarcane	42,17	45,64	57,89	59,88	56,61
Black pepper	1,97	2,20	2,54	2,53	2,52

* Partially revised.

** Final estimates.

N.A.—Estimates not available.

Source: *INDIA: A Reference Annual, 1964.* Published by Ministry of Information and Broadcasting, Government of India.

TABLE I (*Contd.*)

1	2	3	4	5	6
Chillies	14,64	14,93	15,30	15,16	15,40
Ginger	40	40	44	45	44
Tobacco	8,83	10,13	9,89	10,41	10,62
Groundnut	1,11,06	1,26,85	1,54,61	1,58,69	1,64,07
Castor seed	13,72	14,18	10,38	10,95	10,97
Seasamum	54,45	56,67	53,60	55,47	59,89
Rape & mustard	51,18	63,16	70,94	77,58	77,29
Linseed	34,67	37,77	44,33	48,54	46,53
Cotton	1,45,36	1,99,81	1,88,71	1,90,74	1,97,01
Jute	14,11	17,39	15,12	22,80	20,95
Mesta	—	5,71	6,89	9,60	8,61
Tea	7,77	7,80	8,19	N.A.	N.A.
Coffee	2,24	2,49	2,81	N.A.	N.A.
Rubber	1,44	1,74	3,18	3,45	N.A.
Coconut	15,36	15,98	17,71	17,86	N.A.

TABLE II

PRODUCTION OF PRINCIPAL CROPS

CROP	*Unit*	1950-51	1955-56	1957-58	1958-59	1959-60	1960-61*
1	2	3	4	5	6	7	8
Rice (cleaned)	'000 tons	2,02,51	2,71,22	2,51,10	3,03,54	3,09,63	3,37,00
Jowar	„	54,08	66,19	84,97	87,14	80,04	90,85
Bajra	„	25,54	33,74	35,63	37,89	35,19	31,34
Maize	„	17,02	25,61	31,00	33,81	40,06	39,15
Ragi	„	14,07	18,17	17,01	18,77	19,04	16,40
Small millets	„	17,22	20,37	17,03	20,72	20,29	19,49
Wheat	„	63,60	86,22	78,71	97,72	1,00,89	1,06,48
Barley	„	23,40	27,71	22,56	26,72	26,74	27,34
Total cereals	„	4,17,44	5,49,23	5,38,01	6,26,31	6,31,88	6,68,05
Gram	„	35,93	53,32	48,13	68,81	55,02	62,07
Tur	„	16,92	18,32	14,50	16,71	16,67	20,44
Other pulses	„	29,93	37,07	31,41	43,20	43,65	42,16
Total foodgrains	„	5,00,22	6,57,94	6,32,05	7,55,03	7,47,22	7,92,72

* Final estimates.

TABLE II (*Contd.*)

1	2	3	4	5	6	7	8
Potatoes	'000 tons	16,34	28,30	19,72	23,27	27,22	26,56
Sugarcane (cane)	,,	5,61,50	5,95,87	7,00,31	7,04,56	7,52,01	8,50,45
Black pepper	,,	21	28	27	26	26	26
Chillies (dry)	,,	3,45	3,55	3,51	3,26	3,37	3,63
Ginger (dry)	,,	14	16	16	12	15	16
Groundnut (nuts in shell)	,,	34,26	38,01	46,36	48,12	39,42	43,54
Tobacco	,,	2,57	2,98	2,36	2,61	2,81	2,94
Castor seed	,,	1,01	1,23	88	1,12	1,06	98
Sesamum	,,	4,38	4,60	3,53	5,11	3,59	2,88
Rape and mustard	,,	7,50	8,46	9,18	10,25	10,47	13,80
Linseed	,,	3,61	4,13	2,55	4,47	4,31	4,10
Cotton (lint)†	'000 bales	29,10	39,98	47,44	46,86	36,78	53,94
Jute (dry fibre)**	,,	32,83	41,98	39,83	51,58	46,05	40,30
Mesta (dry fibre)**	,,	—	11,53	13,02	14,88	11,18	11,47
Tea	Lakh lbs.	6,07	6,28	6,78	6,99	N.A.	N.A.
Coffee	,,	54	76	89	93	N.A.	N.A.
Rubber	,,	32	50	47	54	52	N.A.
Coconut	crore nuts	3,58	4,37	4,50	4,61	4,62	N.A.

† 392 lbs. each.

** 400 lbs. each.

N.A.—Data not available.

Source: *INDIA: A Reference Annual, 1962*, Ministry of Information and Broadcasting, Government of India.

TABLE III

CROP SEASONS**

Crop	*Season*		*Duration**
Rice	Winter		5½ — 6 months
	Autumn		4 — 4½ ,,
	Summer		2 — 3 ,,
Wheat	Rabi		5 — 5½ ,,
Jowar	Kharif		4½ — 5 ,,
	Rabi		4¼ — 5 ,,
	Zaid Kharif		2½ ,,
Bajra	Kharif		4½ ,,
Maize	Kharif		4 — 4½ ,,
Ragi	Kharif		3½ ,,
Barley	Rabi		5 — 5½ ,,
Gram	Rabi		6 ,,
Sugarcane	Perennial		10 — 12 ,,
Sesamum	Kharif		3½ — 4 ,,
	Rabi		5 ,,
Groundnut	Kharif	Early	4 — 4½ ,,
		Late	4½ — 5 ,,
Rape and Mustard	Rabi		4 — 5 ,,
	Zaid Rabi		4 ,,
Linseed	Rabi		5 — 5½ ,,
Castor	Kharif	Early	6 ,,
		Others	8
Cotton	Kharif	Early	6 — 7 ,,
		Late	7 — 8 ,,
Tobacco	Kharif		7 ,,
Jute	Kharif		6 — 7 ,,

* Denotes the number of months the crop is on land.

** *INDIA: A Reference Annual, 1962.* Ministry of Information and Broadcasting, Government of India.

TABLE IV

PRINCIPAL IRRIGATION WORKS*

	Year of completion	*Total outlay (Rs. lakhs)*	*Area irrigated (thousand acres)*
1	2	3	4
Andhra Pradesh			
Godavari delta system	1890	2,20.0	11,11.0
Nizam Sagar	1931	3,92.0	2,75.0
Romperu drainage	1956	1,28.4	8.2
Rallapad	1957	1,04.0	9.5
Upper Pennar	1958	1,58.0	9.8
K.C. canal	1963-64	7.5	2,78.0
Godavari (stage I)	1962-63	7,84.1	65.0
Prakasam barrage	1959-60	3,91.0	1,17.0
Bhairavani tippa	1961-62	1,44.7	9.7
Bihar			
Sone canals	1874	2,68.0	8,58.0
Kamla canal	1958	30.9	38.0
Mayurakshi left bank canal	1957	81.1	25.0
Tribeni canal extension	1958-59	1,12.9	62.1
Nagi dam	1960-61	40.2	7.5
Gujarat			
Rangola	1952	66.4	19.5
Brahmani	1954	90.8	27.0
Moj	1956	9.4	15.0
Aji	1961-62	65.5	4.2
Machu (I)	1961-62	1,58.5	22.0

* This is not an exhaustive list but contains only selected works.

TABLE IV (*Contd.*)

1	2	3	4
Jammu and Kashmir			
Sind valley	1956	1,24.0	18.0
Kerala			
Kuttanad	1957	59.6	1,21.0
Peechi	1957-58	2,35.0	69.4
Chalakudy (stage I)	1957-58	1,53.2	56.8
Walayar reservoir	1958-59	1,16.7	16.0
Wadakkancheri (Vezhani)	1959-60	1,07.6	17.6
Nayyar (I)	1959-60	2,47.3	38.0
Malampuzha	1959-60	5,32.0	1,09.0
Madhya Pradesh			
Tandula canals	1925	34.0	1,65.0
Mahanadi canals	1927	1,59.0	2,10.0
Sampna	1959	45.2	9.5
Gangulpara	1960-61	51.9	8.5
Madras			
Periyar system	1897	1,08.0	1,43.0
Kaveri Mettur	1934	6,63.0	3,01.0
Perinchari	1956	44.0	6.0
Lower Bhavani	1956	10,47.2	2,07.0
Mettur canals	1957	1,92.9	45.0
Araniar reservoir	1957	1,05.9	6.1*
Krishnagiri	1958	2,02.4	9.0
Sathanur	1959	2,58.0	21.0
Amaravathy	1959	3,29.4	53.5
Kattalai high level canal scheme	1959	2,24.6	20.6
Pullambadi canal scheme	1959	2,06.1	22.1
Maharashtra			
Nira left bank canal	1906	1,06.0	83.0
Pravara river works	1911	1,53.0	84.0

* Madras portion.

TABLE IV (*Contd.*)

1	2	3	4
Maharashtra (*contd.*)			
Nira right bank canal	1938	6,02.0	81.0
Gangapur reservoir	1959	3,96.0	45.0
Mysore			
Krishnaraja Sagar canal	1930	4,50.0	1,00.0
Tunga anicut	1958-59	2,96.9	27.2
Nagu	1958-59	3,11.1	20.0
Ghataprabha left bank canal (stage I)	1958-59	5,67.1	1,20.0
Orissa			
Rushi-Kulya canal system	1895	28.0	1,40.0
Punjab			
Upper Bari Doab canal	1878-79	2,27.0	8,28.0
Western Yamuna canal	1886	4,73.0	10,18.0
Sirhind canal	1886-87	6,70.0	14,83.0
Eastern canal extension	1933	8,38.0	3,49.0
Western Yamuna canal extension	1944-45	1,58.0	1,21.0
Nangal barrage	1954	3,95.0	27,50.0
Dadri	1961	79.0	*
Rajasthan			
Jawai project	1958-59	2,50.0	19.0
Prabati project	1961	1,10.0	30.0
Meja project	1961	71.0	24.0
Sareti	1960	30.0	13.0
Namona	1959	53.0	11.0

* Linked with Western Yamuna Canal.

TABLE IV (*Contd.*)

1	2	3	4
Uttar Pradesh			
Ganga canal	1891	4,65.0	17,27.0
Lower Gangal canal	1891	4,69.0	11,52.0
Betwa canal	1893	1,22.0	2,06.0
Gavai and Ghagar canal	1918	1,20.0	55.0
Sarada canal	1930	11,37.0	19,72.0
Sarada canal extension (1,062 miles)	1955-56	1,37.8	1,76.0
Mata Tila (stage I)	1957-58	4,88.0	2,65.0
Jirgo reservoir	1960	1,26.8	64.0
Sarada sagar (stage I)	1960-61	4,79.0	1,67.4
Belan and Tons canal	1958-59	2,94.1	1,02.0
Agra canal (remodelling)	1959-60	80.0	27.4
Ban Ganga canal	1956-57	43.1	22.0
West Bengal			
Damodar canal	1935	1,30.0	1,72.0
Mayurakshi	1970	20,46.0	6,10.0

Source: *INDIA: A Reference Annual, 1964.* Ministry of Information & Broadcasting, Govt. of India, Pp. 247, 248 & 249.

TABLE V

QUANTITY AND VALUE OF MINERALS PRODUCED*

(*Value in thousand rupees*)

Mineral	*Unit of Quantity*	1962		1963	
		Quantity	*Value*	*Quantity*	*Value*
1	2	3	4	5	6
Coal	'000 tonnes	6,13,70**	133,85,37	6,59,27	155,12,09
Lignite	tonnes	2,10,748**	46,00	9,91,718	2,27,01
Metallic minerals					
(*i*) Ferrous-Chromite	tonnes	66,648	42,09	64,790	41,07
Iron ore	'000 tonnes	1,33,62	10,05,37	1,49,26	11,35,34
Manganese ore	,,	12,26	6,75,32	10,75	5,61,16
(*ii*) Non-ferrous					
Bauxite	'000 tonnes	5,77	59,14	5,65	54,20
Copper ore	,,	4,92	2,31,36	4,74	2,21,29
Gold†	Kilograms	5,080	6,09,93	4,305	5,05,84
Ilmenite	'000 tonnes	1,38	81,49	26	14,14

* Excludes the production from Goa.
** Figures inclusive of those in respect of Jammu and Kashmir.
† Value of the metal given in the absence of the value of the ore.
Source: *INDIA: A Reference Annual, 1964.* Ministry of Information & Broadcasting, Government of India.

TABLE V (*Contd.*)

1	2	3	4	5	6
Lead (concentrate)	tonnes	6,384	23,25	5,920	21,56
Rufile	,,	1,616	15,91	1,871	18,42
Silver†	kilograms	4,314	9,38	3,991	9,14
Zinc (concentrate)	tonnes	9,837	27,16	10,627	29,34
Non-metallic minerals					
Apatite	tonnes	29,018	8,02	1,31,27	3,62
Corundum	,,	301	1,28	658	3,26
Diamond	carats	1,131	3,74	1,432	5,18
Dolomite	'000 tonnes	9,01	1,09,81	10,70	1,26,33
Fireclay	,,	3,46	29,27	3,68	28,89
Gypsum	'000 tonnes	11,21	68,20	11,88	72,32
Kyanite	tonnes	49,618	98,14	31,665	62,24
Limestone	'000 tonnes	1,69,07	8,92,20	1,70,57	9,21,18
Magnesite	tonnes	2,12,888	36,27	234,566	41,44
Mica (crude)	,,	28,354	2,77,15	25,098	2,44,98
Salt (rock)	,,	4,500	2,85	3,400	2,47
Salt (others)	'000 tonnes	38,82	9,55,96	45,35	11,95,08
Sillimanite	tonnes	8,255	3,65	11,285	4,99
Steatite	,,	1,10,449	37,32	1,17,974	39,15

† Value of the metal given in the absence of the value of the ore.

TABLE VI

PETROLEUM PRODUCTION

	1951	1955	1960	1961
	'000 tonnes			
Crude petroleum	264	335	449	442
Petroleum products	249	3,024	5,758	6,100
Light distilates	51	798	1,047	1,069
Kerosene	52	449	931	1,017
Diesels	44	592	1,600	1,669
Lubricants	23	16	22	25
Bitumen	4	85	400	438
Heavy ends	17	1,008	1,693	1,811
Other products	58	75	66	71

Source : *Statistical Outline of India*, p. 23.

TABLE VII

ACHIEVEMENTS IN SELECTED INDUSTRIES

Sl. No.	*Industry*	*Unit*	*1960-61*		*1961-62*		*1962-63*	
			Installed Capacity	*Production*	*Installed Capacity*	*Production*	*Installed Capacity*	*Production*
1	2	3	4	5	6	7	8	9
1.	Iron & Steel	Million tons						
	(*a*) Steel ingots	,,	6.0	3.3	6.0	4.27	6.0	5.30
	(*b*) Saleable Steel	,,	4.5	2.4	4.5	2.9	4.5	4.0
	(*c*) Pig iron for sale	,,	1.1	1.1	1.1	0.97	1.1	1.06
2.	Alloy, tool & Stainless Steel (finished)	'000 tons	—	—	—	—	—	—
3.	Ferro-manganese	,,	157.8	89.3	157.8	103.5**	157.8	108.0
4.	Aluminium	,,	18.1	18.2	27.5	19.4	53.35	41.97
5.	Non Ferrous Metals							
	(*a*) Copper	,,	8.8	8.8	9.0	9.00	9.00	9.48
	(*b*) Zinc	,,	—	—	—	—	—	—
	(*c*) Lead	,,	6.0	3.7	6.0	3.15	6.0	3.37
6.	Cast iron pipes	,,	270	209**	270	229.5**	270	230*

TABLE VII (*Contd.*)

1	2	3	4	5	6	7	8	9
7.	Steel wire ropes	'000	6.1	3.3**	6.27	2.55	15.0	4.8*
8.	Casting and Forging	,,						
	(*a*) Steel casting	,,	39.0	34.0	43.5	40.0	52.2	43.57
	(*b*) Steel forgings	,,	43.0	35.0	48.0	48.0*	56.6	53.0
9.	Industrial Machinery							
	(*a*) Sugar mill machinery	Rs. crores	11.6	4.2**	11.6	4.6**	15	6.42
	(*b*) Cotton textile machinery	,,	12.0	10.4**	12.5	12.5	13.0	13.0*
	(*c*) Cement machinery	,,	1.1	0.6**	4.5	0.9**	5.25	0.7*
	(*d*) Paper machinery	,,	neg.	neg.	1.1	0.4**	4.9	0.85*
10.	Machine tools	,,	8.0	7.24	8.92	8.5	11.3	11.48

* Estimated.

** Calendar year.

Source: *The Third Plan Mid-term Appraisal*, pp. 129.

TABLE VIII

ACHIEVEMENTS IN SELECTED INDUSTRIES

Sl. No.	*Industry*	*Unit*	*1960-61*		*1961-62*		*1962-63*	
			I.C.	*P*	*I.C.*	*P*	*I.C.*	*P*
1.	Agricultural Implements & Machinery							
	(*a*) Power driven pumps	'000 Nos.	128.0	105.0	137.0	128.8	146.45	131.1
	(*b*) Diesel engines (Stationery)	,,	47.7	43.2	49.0	43.02	55.44	45.28
	(*c*) Tractors	,,	neg	neg	5.5	0.88	7.5	1.6*
2.	Sugar	Million Tons	2.25	3.0	2.25	2.7	2.67	2.3
3.	Vanaspati	'000 tons	470.3	350.0	496.0	331.1	496.0	360.2
4.	Fertilisers							
	(*a*) Nitrogenous (in terms of N)	'000 tons	158.3	97.2	238.36	140.0	386.6	175.2
	(*b*) Phosphatic (in terms of P_2O_5)	,,	57.3	53.0**	89.7	61.9	129.6	78.9

* Estimated.

** Calendar year.

I.C.—Installed Capacity.

P—Production.

Source; *The Third Plan Mid-term Appraisal*, pp. 130, 131, 133.

TABLE IX

ACHIEVEMENTS IN SELECTED INDUSTRIES

Sl. No.	*Industry*	*Unit*	*1960-61*		*1961-62*		*1962-63*	
			I.C.	*P*	*I.C.*	*P*	*I.C.*	*P*
1.	Cotton Textile							
	(*a*) Yarn	Million lbs.	12.7*	1737†	13.8*	1900	13.9*	188.6
	(*b*) Cloth	Million yards	1.99‡	5048	1.99‡	5100	2.0‡	4921.0
2.	Jute	'000 tons	1200	1022	1200	1050	1200	1175
3.	Rayon and Synthetic fibres.							
	(*a*) Rayon filament	Million lbs.	52.3	47.0	69.6	52.9	76.7	65.0
	(*b*) Staple fibre	,,	48.0	48.0	56.0	61.4	56.0	71.5
	(*c*) Rayon grade pulp	000 tons	—	—	—	—	6.6	1.2**
4.	Woollen Textiles							
	(*a*) Woollen & worsted yarn	Million lbs.	0.19*	27.8†	0.19*	34.65	0.19*	43.1
	(*b*) Woollen cloth	Million yards	48.0	15.3†	48.0	16.02	48.0	20.6

* Million active spindles.
** Estimated.
† Calender year.
‡ Lakh looms.
I.C.—Installed Capacity.
P.—Production.

Source: *The Third Plan Mid-term Appraisal*, p. 132.

TABLE X

ACHIEVEMENTS IN SELECTED INDUSTRIES

Sl. No.	*Industry*	*Unit*	1960-61		1961-62		1962-63	
			I.C.	*P*	*I.C.*	*P*	*I.C.*	*P*
1.	Electric Transformers (33 KV & below)	Million KVA	1.40	1.39	1.50	1.98	1.96	2.40
2.	Electric Motors (200 HP & below)	Million HP	1.13	0.73	1.13	0.86	1.13	1.03
3.	Electric Cables & wires							
	(*a*) A.C.S.R. conductors	'000 tons	19.3	23.6	31.4	24.8	31.4	30.47
	(*b*) VIR & PVC Cables	Million Yards	463.2	214.2	487.2	243.0	529.2	306.7
	(*c*) Winding Wires	'000 tons	6.8	4.6	7.4	5.64	7.49	6.71
	(*d*) Paper insulated cables	Miles	884.0	620.0	884.0	884.0	884.0	1336.0
4.	Electric fans	Million Nos.	0.85	1.06	0.89	1.08	1.37	1.16
5.	Electric Lamps—G.L.S. & others	„ „	47.6	41.8	47.6	46.6	62.6	58.29
6.	Dry batteries	„ „	224.5	214.2	224.4	206.9	224.5	251.15
7.	Storage batteries	'000 Nos.	379.3	521.2	379.3	533.9	660.3	586.5
8.	Radio receivers	„ „	279	280	303.2	348.0	390.3	360.36

I.C.—Installed Capacity.
P.—Production
Source: *The Third Plan Mid-term Appraisal*, p. 131.

TABLE XI

ACHIEVEMENTS IN SELECTED INDUSTRIES

Sl. No.	Industry	Unit	1960-61		1961-62		1962-63	
			I.C.	P	I.C.	P.	I.C.	P
1.	Road rollers	Number	464	388*	464	564	694	668
2.	Boilers	Rs. Crores	3.7	0.53*	3.7	1.07	8.50	2.17
3.	Railway Rolling Stock							
	(*a*) Locomotives	Number	300	129†	300	248	300	246
	(*b*) Wagons (in terms of four wheelers)	„	26000	69,130†	26000**	19164	26000**	25969
	(*c*) Passenger coaches	„	1800	7332†	1800	1610	1800	1849
4.	Automobile & Ancillary Industries							
	(*a*) Passenger cars	'000 Nos.	20.2	19.1*	20.2	21.78	20.2	20.84
	(*b*) Commercial vehicles	„	28.0	27.5*	28.0	25.50	28.0	25.70
	(*c*) Jeeps & Station Wagons	„	5.5	5.5*	5.5	7.30	5.5	7.44
5.	Motor cycles & Scooters	„	23.0	17.6	24.0	19.13	30.0	23.62
6.	Bicycles	Million Nos.	1.12	1.06	1.44	1.04	1.44	1.10
7.	Ball & Roller Bearings	„	1.7	3.2	3.5	3.3	3.5	4.0

* Calender year.

** Excluding capacity of Railway workshops.

† Relates to five years.

I.C.—Installed Capacity.

P.—Production.

Source: *The Third Plan Mid-term Appraisal*, pp. 129, 130.

TABLE XII

ACHIEVEMENTS IN SELECTED INDUSTRIES

Sl. No.	*Industry*	*Unit*	*1960-61*		*1961-62*		*1962-63*	
			I.C.	*P*	*I.C.*	*P*	*I.C.*	*P*
1.	Rubber manufactures							
	(*a*) Automobile tyres	Million Nos.	1.61	1.49	1.87	1.59	2.4	1.76
	(*b*) Bicycle tyres	,,	15.12	11.15	16.92	11.33	13.7*	12.42
2.	Paper & Paperboard							
	(*a*) Paper & Paperboard	'000 tons	410.0	343.0	410.0	365.0	483.0	393.2
	(*b*) Newsprint	,,	30.0	22.9	30.0	24.8	30.0	26.0
3.	Plywood including fibre board							
	(*a*) Tea-chest	Million sq. feet	140.4	98.2	140.4	99.54	152.32	98.7
	(*b*) Commercial plywood	,,		62.5		72.02		83.0
	(*c*) Fibre board	,,	30.33	18.0	47.25	25.84	47.25	25.9

* Capacity revised as per actual production performance.

I.C.—Installed Capacity.

P.—Production.

Source: *The Third Plan Mid-term Appraisal*, pp. 132 & 133.

TABLE XIII

ACHIEVEMENTS IN SELECTED INDUSTRIES

Sl. No.	*Industry*	*Unit*	*1960-61*		*1961-62*		*1962-63*	
			I.C.	*P.*	*I.C.*	*P.*	*I.C.*	*P.*
1.	Sewing Machines	'000 Nos.	267.4	297.3	267.4	323.0	341.0	330.0
2.	Clocks & Watches							
	(*a*) Clocks	,,	66.0	52.3**	88.0	53.5	132.0	64.0
	(*b*) Time-pieces	,,	60.0	neg	210.0	46.4	210.0	121.2
	(*c*) Watches	,,	—	—	360.0	14.4	670	21.3
3.	Photographic films & Paper	Million Sq. meters	—	—	—	—	—	—
4.	Starch & Glucose							
	(*a*) Starch	'000 tons	148.6	68.5	148.6	70.6**	148.6	75.3*
	(*b*) Liquid Glucose	,,	12.9	8.7	18.45	10.4	18.45	9.72*
	(*c*) Dextrose powder	,,	4.3	2.6	5.67	2.94	5.40	2.78*

* Estimated.

** Calender year.

I.C.—Installed Capacity.

P.—Production.

Source: *The Third Plan Mid-term Appraisal*, pp. 130, 131 & 132.

TABLE XIV

IMPORTS OF PRINCIPAL MERCHANDISE

	1959-60		*1960-61*		*1961-62*	
	Rs. crores	%	Rs. crores	%	Rs. crores	%
Rice	16.34	1.7	22.44	2.0	15.04	1.4
Wheat	129.78	13.5	153.20	13.7	77.55	7.5
Fruits & vegetables	17.69	1.8	20.38	1.8	14.58	1.4
Raw cotton	41.34	4.3	81.77	7.3	62.65	6.0
Petroleum & products	86.77	9.0	69.43	6.2	95.65	9.2
Chemicals	44.36	4.6	39.34	3.5	35.12	3.4
Fertilisers (migd.)	16.32	1.7	9.61	0.9	11.90	1.1
Paper & boards	11.23	1.2	12.10	1.1	15.70	1.5
Iron & steel	84.29	8.8	122.54	10.9	101.98	9.8
Copper	17.74	1.8	21.93	2.0	23.27	2.2
Machinery except electrical	154.80	16.1	203.37	18.1	231.69	22.3
Electrical machinery etc.	53.15	5.5	57.22	5.1	63.01	6.1
Transport equipment	71.38	7.4	72.39	6.5	54.21	5.2
Total imports* (including others)	960.77	100.0	1,121.62	100.0	1,038.68	100.0

* The latest revised total for 1961-62 is Rs. 1,090 crores but commodity-wise break-up of this figure is not yet available.

Source: *Statistical Outline of India*, p. 36.

TABLE XV

COMPOSITION OF IMPORTS

	Capital goods	*Intermediate goods*	*Consumer goods*		*Unclassified*
			Cereals	*Others*	
	As % of total value of imports				
1950-51	20.3	51.1	15.3	8.2	5.1
1955-56	28.7	52.4	2.6	11.3	5.0
1956-57	29.8	54.4	0.9	9.0	5.9
1957-58	29.9	48.5	5.8	6.8	9.0
1958-59	27.7	42.8	18.5	5.7	5.3
1959-60	29.1	46.6	15.6	5.3	3.4
1960-61	30.5	47.0	13.5	5.2	3.8

Note: This Table should be taken to give a broad idea of the composition of India's import trade.

Source: *Statistical Outline of India*, p. 37.

TABLE XVI

EXPORTS OF PRINCIPAL INDIAN MERCHANDISE

	1959-60		*1960-61*		*1961-62*	
	Rs. crores	%	Rs. crores	%	Rs. crores	%
Tea	129.09	20.5	123.60	19.5	122.40	18.6
Coffee	6.33	1.0	7.22	1.1	9.01	1.4
Fruits & vegetables	21.67	3.4	25.98	4.1	25.51	3.9
Tobacco (unmfgd.)	13.53	2.1	14.61	2.3	14.04	2.1
Spices	14.46	2.3	16.61	2.6	17.57	2.7
Raw cotton & waste	14.49	2.3	11.56	1.8	20.37	3.1
Manganese ore & concentrates	11.97	1.9	14.04	2.2	10.42	1.6
Iron ore & concentrates	14.59	2.3	17.03	2.7	17.45	2.7
Mica & manufactures	10.04	1.6	10.15	1.6	9.66	1.5
Vegetable oils	14.81	2.4	8.54	1.4	5.83	0.9
Leather	30.45	4.8	24.85	3.9	25.33	3.9
Hides & skins	11.23	1.8	9.46	1.5	8.25	1.3
Cotton fabrics	64.15	10.2	57.54	9.1	48.39	7.4
Jute fabrics*	64.77	10.3	74.06	11.7	79.35	12.1
Jute bags & sacks	43.63	6.9	57.30	9.1	60.91	9.3
Machinery & transport equipment	2.71	0.4	3.68	0.6	3.93	0.6
Total exports** (including others)	629.90	100.0	632.42	100.0	656.86	100.0

* Hessian and sacking cloth.

** The latest revised total for 1961-62 is Rs. 655.17 crores but commodity-wise break-up of this figure is not yet available.

Source: *Statistical Outline of India*, pp. 38.

TABLE XVII (A)

AREA AND POPULATION*

States	*Area* (in 1000 Kms.)	*Population* (in '000s)		*Percentage increase* 1951-61
		1951	1961	
1	2	3	4	5
Andhra	275.3	31,115	35,983	15.7
Assam	122.0	8,831	11,873	34.5
Bihar	174.0	38,784	46,456	19.8
Gujarat	187.1	16,263	20,633	26.9
Jammu & Kashmir	n.a.	3,254	3,561	9.4
Kerala	38.9	13,549	16,904	24.8
Madhya Pradesh	443.5	26,072	32,372	24.2
Madras	130.4	30,119	33,687	11.9
Maharashtra	307.5	32,003	39,554	23.6
Mysore	192.2	19,402	23,587	21.6
Orissa	155.8	14,646	17,549	19.8
Punjab	122.3	16,135	20,307	25.9
Rajasthan	342.3	15,971	20,156	26.2
Uttar Pradesh	294.4	63,216	73,746	16.7
West Bengal	87.6	26,302	34,926	32.8
Union Territories etc.				
Andaman & Nicobar	8.3	31	64	105.2
Delhi	1.5	1,744	2,659	52.4
Himachal Pradesh	28.2	1,109	1,351	21.8
Laccadive, Minicoy & Amindivi	—	21	24	14.6

*Source: *Statistical Outline of India*, p. 1.

TABLE XVII (A) (*Contd.*)

1	2	3	4	5
Manipur	22.3	578	780	35.0
Tripura	10.5	639	1,142	78.7
Dadra & Nagar Haveli	0.5	42	58	39.6
Goa, Daman & Diu	3.7	638	627	1.7
North East Frontier Agency	81.4	n.a.	337	—
Nagaland	16.5	213	369	14.1
Pondicherry	0.5	317	369	16.3
Sikkim	7.1	138	162	17.8
ALL INDIA	3,053.6	361,130	439,235	21.5

TABLE XVII (B)

VITAL STATISTICS

Annual rate	*Birth rate per* 1,000	*Death rate per* 1,000	*Expectation of life at birth*	
			Males	*Females*
1901—11	51.3	43.1	22.6	23.3
1911—21	49.2	48.6	19.4	20.9
1921—31	46.4	36.3	26.9	26.6
1931—41	45.2	31.2	32.1	31.4
1941—51	39.9	27.4	32.5	31.7
1951—61*	40.0	18.0	—	—

* Assumption made in 1961 Census Report (Paper No. 1) pending final examination of data.

Source: *Statistical Outline of India*, p. 1.

TABLE XVIII

TOTAL LITERATE POPULATION

(Figures in thousands)

	1951			1961		
	Persons	*Males*	*Females*	*Persons*	*Males*	*Females*
1	2	3	4	5	6	7
INDIA	59,261,114	45,610,431	13,650,683	105,333,281*	77,823,163*	27,505,118*
Andhra Pradesh	4,106,060	3,099,803	1,006,257	7,626,527	5,482,333	2,144,194
Assam	1,633,753	1,303,087	330,666	3,248,055	2,361,724	886,331
Bihar	4,721,411	3,992,141	729,270	8,547,845	6,950,967	1,596,878
Gujarat	n.a.	n.a.	n.a.	6,283,256	4,373,373	1,909,883
Jammu & Kashmir	n.a.	n.a.	n.a.	392,761	321,827	70,934
Kerala	5,518,908	3,357,175	2,161,733	7,919,220	4,596,265	3,322,955
Madhya Pradesh	2,563,786	2,151,338	412,448	5,444,862	4,481,454	1,063,408
Madras	6,255,018	4,740,242	1,514,776	10,580,616	7,532,323	3,408,293
Maharashtra	10,448,350**	7,870,186**	2,578,164**	11,793,070	8,588,657	3,204,413
Mysore	3,742,283	2,867,486	874,797	5,990,585	4,352,428	1,638,157
Orissa	2,313,431	1,978,705	334,726	3,801,245	3,042,004	759,241
Punjab	2,457,496	1,825,953	631,543	4,971,396	3,591,177	1,326,219
Rajasthan	1,425,416	1,197,209	228,207	3,065,568	2,504,983	560,585

TABLE XVIII (*Contd.*)

1	2	3	4	5	6	7
Uttar Pradesh	6,825,072	5,752,580	1,071,492	13,013,183	10,546,793	2,466,388
West Bengal	6,309,159	4,824,134	1,485,025	10,225,664	7,454,006	2,771,658
Andaman and Nicobar Islands	7,980	6,513	1,467	21,372	16,675	4,697
Delhi	669,073	424,118	244,955	5,495	4,342	1,153
Himachal Pradesh	85,509	72,972	12,537	1,402,298	904,801	697,497
Laccadive, Minicoy and Amindivi Islands	3,204	2,635	569	5,610	4,273	1,337
Manipur	65,895	58,932	6,963	237,276	174,656	62,620
Tripura	99,197	74,975	24,222	231,188	175,060	56,128
Dadra and Nagar Haveli	n.a.	n.a.	n.a.	5,495	4,342	1,153
Goa, Daman & Diu	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
N.E.F.A.	n.a.	n.a.	n.a.	24,260	21,879	2,381
Nagaland	n.a.	n.a.	n.a.	66,117	45,917	20,200
Pondicherry	n.a.	n.a.	n.a.	138,147	92,384	45,765
Sikkim	10,113	9,247	866	19,999	16,721	3,278

* Excludes Goa, Daman & Diu.

** Refers to Old Bombay State.

Source: *Statistical Abstract of the Indian Union 1962.* New Series No. 11.
Central Statistical Organisation, Department of Statistics, Government of India.

TABLE XIX

GROWTH OF URBANISATION

	1901	1931	1941	1951	1961
NUMBER OF TOWNS					
Class I	27	32	49	74	107
Class II	45	56	87	111	141
Class III	148	224	272	375	515
Class IV	422	484	553	670	817
Class V	768	856	988	1,189	844
Class VI	500	609	478	638	266
TOTAL	1,910	2,261	2,427	3,057	2,690
POPULATION OF TOWNS (Mn.)					
Class I	6	8	14	24	35
Class II	3	4	6	8	10
Class III	4	7	8	11	16
Class IV	6	7	8	9	11
Class V	5	6	7	8	6
Class VI	2	2	2	2	1
TOTAL	26	34	45	62	79

Source: *Statistical Outline of India*, p. 12

TABLE XX

RURAL AND URBAN POPULATION, 1961 (State-wise)

	Population (Mn.)		*Number of towns*			
	Rural	*Urban*	*Class I*	*Class II*	*Class III*	*Total**
Andhra	29.7	6.3	11	9	51	223
Assam	11.0	0.9	1	2	10	60
Bihar	42.5	3.9	7	7	32	153
Gujarat	15.3	5.3	6	9	43	181
Jammu & Kashmir	3.0	0.6	2	—	1	43
Kerala	14.3	2.6	4	5	31	92
Madhya Pradesh	27.7	4.6	6	6	35	219
Madras	24.7	9.0	9	19	62	338
Maharashtra	28.4	11.2	12	15	47	265
Mysore	18.3	5.3	6	10	32	230
Orissa	16.4	1.1	1	3	8	62
Punjab	16.2	4.1	5	13	35	187
Rajasthan	16.9	3.3	6	4	23	145
Uttar Pradesh	64.3	9.5	17	18	56	275
West Bengal	26.4	8.5	12	19	46	184
Delhi	0.3	2.4	2	—	1	3
Total (including others)	359.8	78.8	107	141	515	2,690

* Including Class IV, V, and VI towns.

Source: *Statistical Outline of India*, p. 12.

BIBLIOGRAPHY

1. *Agriculture and Animal Husbandry in India*—by M. S. Randhawa, Indian Council of Agricultural Research, New Delhi, 1958.

2. *Cereal Crops*—by Leonard & Martin, Macmillan Co., New York, 1963.

3. *India—A Reference Annual 1964*, Ministry of Information and Broadcasting, Government of India.

4. *Indian Economy 1961-1963* (*Conditions and Prospects*), National Council of Applied, Economic Research, 1963.

5. *Rice in India*—by Ghose, Ghatge and Subrahmanyan, Indian Council of Agricultural Research, New Delhi, 1960.

6. *Soils in India*—by S. P. Raychaudhuri and four associates, Indian Council of Agricultural Research, New Delhi, 1963.

7. *Statistical Outline of India* (6th Edition). Department of Economics & Statistics, Tata Ind: (P) Ltd., Bombay 1. 1963.

8. *The Third Plan Mid-Term Appraisal*, Planning Commission, Government of India, Nov. 1963.

INDEX

Aluminium, 14
Anaimalai, 2
Animals, 17, 18
Assam, 13
Aviation, 81, 90, 91

Bajra, 30, 31
Bangar, 9
Barley, 28
Bauxite, 11, 12, 13 14, 57
Bengal, West, 12
Betel, 40
Bhadravati Iron & Steel Works, 67
Bhakra Nangal, 63
Bhakra Right Bank Power Station, 66
Bihar, 12
Birth-rate, 94
Brahmaputra, 81
Buckingham Canal, 81

Cardamom Hills, 38
Cardamom, 38
Castor, 34, 35
Cement, 77
Cereals, 21, 52, 99
Charcoal, 67
Chemicals & Drugs, 76
Cherrapunji, 6
Chillies, 37
Chromite, 13,14
Cinnamon, 39
Climate, 3
Clove, 39
Coal, 11, 12, 13, 14, 58, 59
Coconut, 33, 34
Communication, 81
Consolidation of Holdings, 53
Coniferous, 17
Copper, 13
Cottage Industries, 57
Cotton, 45, 46, 98
Cotton Industry, 72

Death-rate, 94
Deciduous forest, 17

Electricity Consumption in India, 68
Engineering Industries, 74-75

Fauna (distribution), 18
Fertilizer Industry, 77
Foreign Aid, 97
Foreign Trade, 97
Forests, 15-17
Fruits, 51, 52, 98

Ganga, 81
Gangetic Plain, 8, 9
Gas, 59, 60, 62
Geology, 8
Ginger, 39
Gold, 12 ,13
Grams, 32
Grasslands, 15, 16
Groundnut, 34

Haemetite, 13
Himalayas, 2, 9, 81
Holdings, 53

Horticulture, 51, 52
Hydro-electricity 63-67

Iddi ki Hydro-electric scheme, 65
Ilmenite, 12
Imports, 99
Industrial Estates, 79
Industrial Machinery, 69-70
Industrial Revolution, 56
Industries, 56, 69-80
—small-scale, 56, 79
—cottage, 56, 79
—large-scale, 57
—engineering, 74-76

Jowar, 30
Jute, 42, 46-48, 98
Jute Industry, 72, 73

Kerala, 33, 57
Khadar, 9
Khasi Jaintia, 5, 6,
Koyna Project, 65

Land-use, 21
Leather, 98
Lignite, 13, 14, 59
Limestone, 12, 13, 57
Linseed, 36
Literacy, 95, 96

Machinery, 99
Machkund Project, 64
Magnetite, 13
Maize, 32
Manganese 12, 13, 57
Mangrove, 17
Matches, 79
Mechanisation of Farming 52
Mettur Tunnel Hydro-electric Scheme, 65
Mica, 11, 13, 14, 22, 57
Millets, 29
Minerals, 11
Monazite, 13
Monsoon, 70
Muscovite, 14
Mustard, 35

Nallamalai, 2
National Highways, 87, 88
Natural Vegetation, 15
Neyveli Lignite Project, 59
Nilgiri, 2
Nuclear Energy, 67
Nutmeg, 39

Oil-seeds, 33

Paper Industry, 78, 79
Peninsular Massif, 1
Peninsular Plateau 1, 2,
Pepper 36, 37
Petroleum, 12, 13, 15, 57, 59-62
Planning, 50
Plantation crops, 22
Podzols, 9
Population, 19, 94
Postal and other Communications, 92
Power, 52, 57-68
Precipitation,
—distribution, 5
—variability, 7
Pulses, 32

Ragi, 31
Railway, 81, 82-85
Rape, 35
Rice, 22-26, 52
Rihand Dam Project, 66
Roads, 81, 85-88
Rubber, 42, 48-49
Rural Electrification, 52

Sal, 17
Sandal, 17

Seasons (of India), 4
Seaways, 89, 90
Sesamum, 35
Sharavati Hydro-electric Project, 65
Shevaroy, 2
Soils, 8-10
Spices, 33
Srisailam Hydro-electric Project, 65
Sugar-cane, 42,44
Sugar Industry, 78

Tea, 42, 43, 98
Teak, 17
Telegraphs, 92, 93
Telephones, 93
Textile Industry, 72
Thorium, 57
Tobacco, 41
Toilet Articles, 79
Tourism, 91, 92
Transportation,, 81
Turmeric, 39

Urban Growth, 96

Variability of Rainfall, 7, 8
Vegetable Oils, 79

Water power, 57
Water-ways, 88, 89
Wheat, 22, 26-28, 53

Yamuna Hydel Scheme, 66

INDIA — THE LAND AND PEOPLE SERIES

BOOKS UNDER PREPARATION

AGRICULTURE

1. Food Crops	Dr. M. S. Swaminathan, Director, Indian Agricultural Research Institute, New Delhi.
2. Fruits	Prof. Ranjit Singh, Horticulture Division, Indian Agricultural Research Institute, New Delhi.
3. Crop Pests	Dr. S. Pradhan, Head of the Division of Entomology, Indian Agricultural Research Institute, New Delhi.
4. Plant Diseases	Dr. R. S. Mathur, Plant Pathologist to Government of U.P., Kanpur.

ARCHAEOLOGY

5. The Story of Indian Archaeology	Dr. Y. D. Sharma, Superintending Archaeologist, Archaeological Survey of India, South-West Circle, Aurangabad.

BOTANY

6. Common Indian Ferns	Dr. S. C. Verma, Department of Botany, Punjab University, Chandigarh.
7. Shrubs and Climbers of India	Prof. M. B. Raizada, Principal, D.A.V. Post-Graduate College, Dehra Dun.

CULTURE

8. Temples of South India	Shri K. R. Srinivasan, Superintendent, Archaeological Survey of India, Southern Circle, Madras

9.	TEMPLES OF NORTH INDIA	Shri Krishna Deva, Superintendent, Archaeological Survey of India, North-Western Circle, Dehra Dun.
10.	MUSIC	Thakur Jaideva Singh, Formerly Chief Producer (Music), A.I.R., New Delhi.
11.	DANCE	Shri Mohan Khokar, Special Officer (Dance), Sangeet Natak Akademi, New Delhi.
12.	INDIAN COINS	Dr. Parmeshwari Lal Gupta, Patna Museum, Patna.
13.	URDU LITERATURE	Shri Gopi Nath Aman, Delhi.

GEOGRAPHY

14.	ATLAS OF INDIA	Dr. S. P. Chatterjee, Director, National Atlas Organisation, Calcutta.
15	GEOGRAPHY OF HIMALAYAS	Dr. R. L. Singh, Prof. and Head of the Department of Geography, Banaras Hindu University, Varanasi.
16.	GEOGRAPHY OF ANDHRA PRADESH	Dr. Shah Manzoor Alam, Director, Hyderabad Metropolitan Research Project, Osmania University, Hyderabad.
17.	GEOGRAPHY OF BIHAR	Dr. P. Dayal, Department of Geography, Patna University, Patna.
18.	GEOGRAPHY OF DELHI	Dr. M. P. Thakore, Reader in Politics, Indian Institute of International Studies, New Delhi.

19.	GEOGRAPHY OF GUJARAT	Dr. K. R. Dikshit, Department of Geography, University of Poona, Poona.
20.	GEOGRAPHY OF MADRAS	Dr. (Miss) A. R. Irawathy, Principal, Queen Mary's College, Madras.
21.	GEOGRAPHY OF MADHYA PRADESH	Dr. K. N. Varma, Prof. and Head of the Department of Geography, Government T.R.S. College, Rewa, M.P.
22.	GEOGRAPHY OF MAHARASHTRA	Dr. C. D. Deshpande, Director of Education, Government of Maharashtra, Poona-1.
23.	GEOGRAPHY OF MYSORE	Dr. L. S. Bhat, Professor, Indian Statistical Institute, (Regional Survey Unit) Yojana Bhawan, New Delhi.
24.	GEOGRAPHY OF ORISSA	Shri M. M. Hasan Reader and Head of the Department of Geography, Ravenshaw College, Cuttack-3
25.	GEOGRAPHY OF THE PANJAB	Dr. O. P. Bharadwaj, Principal, Government College, Ludhiana.
26.	GEOGRAPHY OF HARYANA	— do —
27.	GEOGRAPHY OF WEST BENGAL	Prof. S. C. Bose, Department of Geography, University of Gorakhpur, Gorakhpur (U.P.)
28.	GEOGRAPHY OF UTTAR PRADESH	Dr. A. R. Tiwari, Head of the Department of Geography St. John's College, Agra.
29.	GEOGRAPHY OF ASSAM	Dr. H. P. Das, Professor and Head of the Department of Geography, Gauhati University, Gauhati.

30.	INDIA—A GENERAL SURVEY	Dr. George Kuriyan, Professor of Geography, Department of Geography, University of Madras, Madras.
31.	GEOGRAPHY OF KERALA	do do
32.	MEDICAL GEOGRAPHY OF INDIA	Dr. R. P. Misra, Head of the Department of Geography, University of Mysore.

METEOROLOGY

33.	THE MONSOON AND RAINFALL	Dr. P. K. Das, Director, Meteorological Department, New Delhi.

SOCIOLOGY AND SOCIAL SCIENCES

34.	DEMOCRACY IN INDIA	Prof. V. K. N. Menon, Trivandrum.
35.	THE STORY OF INDIA'S LANGUAGE	(Gen. Ed.) Dr. S. M. Katre, Director, Deccan College Post-Graduate and Research Institute, Poona-6.
36.	PEOPLE OF INDIA	Shri Surjit Sinha, Deputy Director, Anthropological Survey of India, Calcutta.
37.	LAW IN INDIA	Dr. G. S. Sharma, Director, The Indian Law Institute, New Delhi.

ZOOLOGY

38.	INSECTS	Dr. A. P. Kapur, Deputy Director, Zoological Survey of India, Calcutta and Shri K. C. Pradhan Superintending Zoologist, Zoological Survey of India, Calcutta

39.	MAMMALS OF INDIA	Dr. B. Biswas, Superintending Zoologist, Zoological Survey of India, Calcutta and Shri H. Khajuria, Superintending Zoologist, Zoological Survey of India, Central Regional Centre, Jabalpur.
40.	FISHES	Dr. (Miss) M. Chandy Principal, Miranda House, University College for Women, Delhi-7.

(*Note*: *Other assignments are being negotiated with eminent authors.*)

INDIA—THE LAND AND PEOPLE SERIES

BOOKS PUBLISHED

FLOWERING TREES

by DR. M. S. RANDHAWA

An interesting account of flowering trees of India. There are 55 illustrations including 14 in colour. Demy 8 vo. pp. 188

Popular Edn. Rs. 6.50 Library Edn. Rs. 9.50

ASSAMESE LITERATURE

by PROF. HEM BARUA

A comprehensive history of Assamese Literature. Demy 8 vo. pp. 288

Popular Edn. Rs. 5.00 Library Edn. Rs. 7.50

SNAKES OF INDIA

by DR. P. J. DEORAS

All about snakes found in India and their identification. It contains nearly 75 illustrations, including 16 in colour. Demy 8 vo. pp. 184

Popular Edn. Rs. 6.50 Library Edn. Rs. 9.50

LAND AND SOIL

by DR. S. P. RAYCHAUDHURI

Types of soils in India, their utility, causes for deterioration and improving the quality. There are 38 plates, 26 diagrams and 5 maps. Demy 8 vo. pp. 180

Popular Edn. Rs. 5.25 Library Edn. Rs. 8.25

MINERALS OF INDIA

by MRS. MEHER D. N. WADIA

(EDITED BY DR. D. N. WADIA, F.R.S.)

An account of the mineral wealth of India with 10 monochrome plates including 1 map. Demy 8 vo. pp. 216

Popular Edn. Rs. 5.25 Library Edn. Rs. 8.25

COMMON TREES

by DR. H. SANTAPAU

Deals with the common trees found in India. There are 34 illustrations, 12 in colour and 17 diagrams. Demy 8 vo. pp. 148

Popular Edn. Rs. 5.25 Library Edn. Rs. 8.25

DOMESTIC ANIMALS

by HARBANS SINGH

An account of the various types of domestic animals and country's livestock. There are 20 monochrome plates. Demy 8 vo. pp. 172

Popular Edn. Rs. 4.25 Library Edn. Rs. 8.00

FORESTS AND FORESTRY

by SHRI K. P. SAGREIYA

Contains all the relevant information about forests and forestry in a simple language for the non-specialist. It has 33 illustrations, 5 maps and one chart. Demy 8 vo. pp. 236

Popular Edn. Rs. 5.25 Library Edn. Rs. 8.50

GEOGRAPHY OF RAJASTHAN

by DR. V. C. MISRA

A geographical survey of the State of Rajasthan with its various aspects. There are 27 illustrations and 24 maps. Demy 8 vo. pp. 204

Popular Edn. Rs. 6.00 Library Edn. Rs. 8.25

GARDEN FLOWERS

by DR. VISHNU SWARUP

Gives full information about garden flowers with their distinguishing characteristics with 58 illustrations including 16 in colour. Demy 8 vo. pp. 284

Popular Edn. Rs. 6.00 Library Edn. Rs. 9.50

POPULATION

by DR. S. N. AGARWALA

A systematic investigation into the causes of population growth and its influence on human welfare. There are nine diagrams. Demy 8 vo. pp. 260

Popular Edn. Rs. 3.75 Library Edn. Rs. 7.00

NICOBAR ISLANDS

by KAUSHAL KUMAR MATHUR

An interesting account of the land and people of Nicobar Islands touching almost all aspects of their life. There are 12 illustrations and a map. Demy 8 vo. pp. 260

Popular Edn. Rs. 5.50 Library Edn. Rs. 9.00

COMMON BIRDS

by DR. SALIM ALI AND MRS. LAEEQ FUTEHALLY

Gives important characteristics of the common birds of India. It has approximately 100 coloured illustrations. Demy 8 vo. pp. 140

Popular Edn. 9.00 Library Edn. Rs. 15.00

BOOKS IN PRESS

VEGETABLES

by DR. B. CHOUDHARY

PHYSICAL GEOGRAPHY OF INDIA

by PROF. C. S. PICHAMUTHU

MEDICINAL PLANTS

by DR. S. K. JAIN

GEOLOGY OF INDIA

by DR. A. K. DEY

FLOWERING TREES

(Reprint edition)

by DR. M. S. RANDHAWA

OUR OTHER SERIES

NATIONAL BIOGRAPHY

BOOKS PUBLISHED

GURU GOBIND SINGH

by DR. GOPAL SINGH

English	Rs. 2.00
Hindi	Rs. 2.00

TYAGARAJA

by PROF. SAMBAMOORTHY

English	Rs. 2.00

PT. VISHNU DIGAMBAR

by SHRI V. R. ATHAVALE

English	Rs. 2.00
Hindi	Rs. 1.25
Gujarati	Rs. 1.25
Marathi	Rs. 1.25

PT. BHATKHANDE

by DR. S. N. RATANJANKAR

English	Rs. 1.25
Hindi	Rs. 1.25
Gujarati	Rs. 1.25
Marathi	Rs. 1.25

GURU NANAK

by DR. GOPAL SINGH

English	Rs. 2.25

AHILYA BAI

by SHRI HIRA LAL SHARMA

Hindi	Rs. 1.75

KABIR

by DR. PARAS NATH TIWARI

Hindi	Rs. 2.00

MAHARANA PRATAP

by SHRI R.S. BHATT

Hindi	Rs. 1.75

The Series aims at making available to the ordinary educated man, the non-specialist, knowledge about all aspects of this country in sizable and readable volumes with suitable diagrams and illustrations. It will cover a wide variety of subjects, including agriculture, anthropology, botany, culture, geography, geology, languages, literature, sociology and social sciences, zoology etc. Briefly, it will form a kind of encyclopaedic library on India. The books are being written by acknowledged authorities on different subjects or under their expert supervision and will be factual and scientific. The language will be simple and easily understandable.